Tacting private events: An investigation into the social and emotional experience of children with autism spectrum disorder.

Conallen, Kevin Joseph

Tacting *Private Events*: An Investigation into the Social and Emotional Experience of Children with Autism Spectrum Disorder

Kevin Joseph Conallen

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"One sees clearly only with the heart. Anything essential is invisible to the eyes."

Antoine de Saint Exupéry

Summary

Recognizing how another person feels remains one of the greatest challenges children with Autism Spectrum Disorders (ASD) face in developing social language and behaviour. This deficit makes it difficult to build friendships and experience genuine empathy for others. In order to overcome this, children with ASD need to be taught to tact their own *private events*, and the public correlates associated with the display of the 'emotions' of others.

This investigation tested the ability of children with ASD to tact *private events*, while measuring the subsequent relational outcomes in spontaneously emitted language interactions, engagement in inappropriate behaviours and generalization to other forms of verbal behaviour. Ten school aged children, with diagnosis of ASD disorders participated in a series of studies, designed to shape tacts for *private events* as conditioned reinforcers, teach conversational skills based on observation and comment, to tact the *private events* of others, and to recognize changes in emotion as they occur. A "Control Group" of ten additional children with ASD, who did not receive any instruction in tacting *private events,* was then compared to the " Intervention Group" to determine any subsequent changes that may have resulted from the training.

The results from these studies provides some evidence that suggests children with autism can reliably be taught to tact *private event*s, both their own and the public correlates of others, which can lead to generative spontaneous language social language interactions, reduce engagement in inappropriate behaviour repertories, which suggests that the deficits of perspective taking may not be entirely static. Suggestions for future research and investigations are provided in the discussion, and possibilities for improving the methods used in this series of experiments are reviewed. Practical and theoretical implications and limitations are also summarized.

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated. Where corrections services have been used, the extent and nature of the corrections is clearly marked in a footnote(s).

Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

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CONTENTS

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PUBLICATIONS AND CONFERENCES

A number of the investigations presented in this thesis have previously been presented a number of International Conferences, in Europe and in the United States. A pilot Study for "The Effects of a Conversation Prompt Procedure" was first presented as a paper at the Association of Behavior Analysis First International ABA Conference in Venice Italy, in 2001. The full presentation of that study was then presented as a paper at the Experimental Analysis of Behaviour Group conference in London, in 2002.

"Teaching Children with ASD to Tact the Private Events of Others" was a poster presented at the European Association of Behavior Analysis Annual Convention, in Parma Italy, in 2003.

Both "Teaching Children with ASD to Initiate a Conversation" and "Teaching Children with ASD to Initiate a Conversation: Building Simple Sentences to Tact *Private Events* with Greater Fluency" were papers presented at the Association for Behavior Analysis 29th Annual Convention, in Boston Massachusetts, in 2004.

1 LITERATURE REVIEW

1.1 AUTISTIC SPECTRUM DISORDER

1.1.1 Diagnostic Criteria

Autism Spectrum Disorder (ASD) is a severe developmental disorder characterized by an impairment in social relations, which was first described by Leo Kanner (1943) and Hans Asperger (1944), who independent of each other, published accountants of the condition. Kanner described the autistic child as having a fundamental inability to relate to others, expressing an extreme aloneness, which shuts out everything from the outside world (Kanner; p. 217-250); while Asperger's description is far wider than Kanner's, and includes individuals with organic damage, and those that were nearly normal in development (Asperger; p. 76-136). Today, Kanner's ASD is usually reserved for those individuals displaying 'classic' features of ASD, whereas those demonstrating unusual intelligence, highly developed verbal skills and the "nearly normal" are described as having 'Asperger's Syndrome'.

The Diagnostic and Statistical Manual of Mental Disorders IV-R (4th Edition-Text Revision, American Psychiatric Association, 2000) systematizes the spectrum of 'classic' autistic behaviours under the heading of pervasive developmental disorder (PDD), which includes a number of subtypes, most notably classic ASD and pervasive developmental disorder not otherwise specified (PDDNOS; whose basic impairment is in relating and communicating while not all of the formal criteria for autistic disorder have be met). For both, the deficits are in the areas of social interaction, communication, and restricted, repetitive, and stereotyped patterns of behaviour, interests and activities.

Kanner (1943) described the traits of ASD as: (1) the inability to develop relationships with people, (2) extreme aloofness, (3) a delay in speech development,

(4) lack of imagination, (5) insistence on sameness, (6) repetitive patterns, and (7) islets of ability, although the diagnostic characteristics has evolved through the decades since Kanner's (1943) initial description. Four essential characteristics for diagnosis were proposed by Rutter (1968), and include: (1) a lack of social interest and responsiveness, (2) impaired language, (3) unusual motor behaviour, and (4) an early onset, before 30 months of age.

Above all, children with ASD appear unable to engage in normal affective relationships, due to the cardinal features of autistic aloneness, and the obsessive insistence of sameness (Frith, 1989; p. 10-11). ASD is a diagnosis that defines the individual's development throughout life, and does not go away in time, but can instead be compensated for through carefully targeted interventions and 'therapy'. Although there will remain a persistent deficit, the area of emotional, social and language development will likely hold the key to guaranteeing a favourable outcome, reducing the aloofness, aloneness and need of sameness.

Definitions of ASD are included in the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9, 1980), and the International Classification of Disease – 10th Edition (ICD-10, 1990); as well as editions of the Diagnostic and Statistical Manual of Mental Disorders, II, III-R, and IV-TR (APA 1980; 1987; 2000). Each new edition, and manual, has offered slight variations on the previous definition, as attempts to fine-tune the diagnostic criteria have distinguished the recent history of ASD. Equally, the models, which have defined the way researchers have approached the disorder, have been as varied, leading to a broad range of treatment options.

1.1.2 Conceptualizing ASD: Selected Models

The "Historical" and "Theoretical Models" of ASD have evolved significantly over the past 50 years, but are rooted in the 1940's, with the early work of Kanner (1943) and Asperger's (1944), who both suggested that it was an inborn biological disorder. This model was reinterpreted by Bruno Bettleheim (1967) to be a psychiatric disability, resulting from parent-child pathology, the so called "refrigerator mother syndrome" (Yeung-Courchesne & Courchesene, 1997). Although the differences in perception and behaviour have since been attributed to neurological differences, Bettleheim's ideas have persisted in the minds of many professionals (Wing, 1991).

The "Clinical-Behavioural Model" conceptualizes ASD as a *thematization* disorder (Dunchan & Palermi, 1982), described as the cognitive ability to think representationally, which, when impaired results in difficulty understanding events, sequencing, or perceiving order. Their general argument is that individuals with ASD create meaning in ways different from typically development, and use self-stimulatory behaviours, unusual language, and inappropriate speech and actions functionally (Duchan & Palermo, 1982; Wing, 1991; Maurice, 1993). Proponents of this model argue that individuals with ASD lack the ability to understand experiences outside themselves (Baltaxe & Simmons, 1992; Russell & Jarrold, 1998), which results in bizarre or irrelevant social communication skills, while also displaying deficits in "Theory of Mind"/ perspective taking skills (Baron-Cohen, 1991).

Deficiencies associated with carrying out one's intentions, are central to the "Dyspraxia Model" (Bilken, 1990; 1993; Donnellan, Sabin & Majure, 1992), defined as a disorder of praxis rather than thought. This model for ASD offers some salient evidence for the frustration and inconsistent performance seen in individuals with autism (Barron & Barron, 1992; Park, 1982). The most recent model of ASD, which benefits from clinical observations and biological studies, is the "Neurological Model". In this model, the difficulties with communication, social interaction, organization, and attention, are thought to be symptomatic of damage to specific areas of the central nervous system (Courchesne, Townsend & Chase, 1995). Although general disagreement on the site of the damage continues, there is a growing body of evidence to suggest some neurological differences do exist (Cox & Mesibov, 1995; Hughes, Russell & Robbins, 1994; Shea & Mesibov, 1985).

The history of changes that have been introduced into the diagnostic manuals, and descriptive models, since Kanner (1943) described the disorder, reflect the general agreement that ASD is marked by great variation within the symptoms, and in the variety of descriptive models being considered. This variation has made aetiology, prognosis, and treatment for children with ASD difficult to determine, as there has been a lack of specificity in the diagnostic criteria, and with the taxonomic validity, both confounded by the differing "schools of thought" (Tsai, 1992).

1.2 EMOTIONS & THE *PRIVATE EVENT*

1.2.1 Understanding Emotion

Children on the Autistic Spectrum, including those with Asperger's' syndrome, and pervasive developmental delay are often thought of as being skilled at 'systematizing' their world, to varying degrees, although they are less capable at 'empathizing'. 'Systemizing' can be thought of as a drive to analyze, explore and construct, by identifying how things work, and by defining the underlying rules that govern behaviour in order to understand and predict behaviour. Alternatively 'empathizing' can be defined as the drive to identify the emotions and thoughts of another person, while responding with an appropriate emotion, in order to understand

and predict the behaviour of another person (Baron-Cohen, 2003). Kanner (1943) argued that the autistic child has come into the world with an "innate inability to form the usual biologically provided affective contact with other people, just as other children come into the world with innate physical or intellectual handicaps" (p. 250). The question then must be asked, can this deficit be mediated, and what skills are necessary to an adequate instruction in teaching "empathy".

In order to better understand the emotions of others individuals need to be able to tact their own *private events*, those of others and be prepared for the social language responses that are required to empathize with the emotions of others. Hobson (1986a, 1986b) and his colleagues (Hobson, Ouston & Lee, 1988) tested the hypothesis that people with ASD are unable to enter into emotional relationships with others because they cannot understand emotional expressions. Aside from understanding emotional expressions, few studies have investigated the more fundamental questions of whether people with ASD understand what causes emotions (Tantam, Managhn, Nicholoson & Stirling, 1989), or have addressed the pedagogical limitations of an adequate instruction in 'emotions', tacting *private events*, and recognizing the situational information to help identify an emotion.

1.2.2 Tacting Emotions: The Behavioural Dilemma

Behaviourism, the philosophy of the science of behaviour, is often thought to ignore consciousness, feelings and states of mind, regarding no role to a 'self' or 'sense of self' (Skinner, 1953). Instead, Skinner argues, "feelings occur at just the right time to serve as causes of behaviour" (1974; p. 11). Therefore, when we talk about 'feelings', what we are talking about are the causes of behaviour, both the *public event* (what is observable), and what is unobservable, defined as a *private* *event* (e.g. a stimuli). More specifically, *private events*, describe a small but important part of the universe that in enclosed with the skin of each individual, and therefore are defined as verbal behaviour “under the control of stimuli to which the speaker alone is able to react” (Skinner, 1957; p 130). Such that an individual’s response to my ‘tooth aches,’ is controlled “by a state of affairs which no one but the speaker can establish a [certain kind of] connection” (Skinner, 1957; p. 130). *Private events* do not then refer to any special structure or nature within the individual, and are primarily distinguished by their limited accessibility. Joys, sorrows, loves and hates, are peculiarly our own, and as they “take place during emotional excitement or in states of deprivation are often uniquely accessible” to the individual (Skinner, 1953; p.130). Therefore, any science of human behaviour can be thought to “mistrust verbal responses which describe *private events*,” where “variables are often operating which tend to weaken the stimulus control of such descriptions, and the reinforcing community is usually powerless to prevent the resulting distortion.”

> The individual who excuses himself from an unpleasant task by pleading a headache cannot be successfully challenged, even though the existence of the *private event* is doubtful. There is no effective answer to the student who insists, after being corrected, that that was what he “meant to say,” but the existence of this *private event* is not accepted with any confidence (Skinner, 1954; p. 260).

This ability to ‘understand’ an emotion was described by Skinner (1957; pp.277-280) as being reinforced by the verbal community for tacting (labelling) a *private event*, both ones own and the public correlates of another. The “tact” is an invented term and is used to define a verbal operant in which "a response of given form is evoked (or at least strengthened) by a particular object or event or property of an object." (1947; p. 81-82). The three term contingency in this operant is exemplified when, in the presence of being happy, a child achieved some sort of generalized form of reinforcement by saying 'happy'; or when a picture of a 'happy' child is occasioned by the response 'child happy'. This fundamental form of verbal behaviour can be thought of as making contact with the physical world, while remaining under the control of the prior stimulus. The ability to tact these *private events*, both our own and those of others is an essential skill in maintaining meaningful social relations both as a child, and through out our lives as an adult (Place, 1993). Despite its importance in our social world, it is often a skill that is both, absent, or severely disordered, in individuals with ASD, who suffer aloneness and emotional detachment (Kanner 1943; Frith, 1991).

The question that needs to be asked is, can we effectively mediate this deficit by teaching individuals with ASD to tact their own *private events* and those of others? In order to answer this question, we must first identify what it means to tact a *private event*, both our own and those of others; we need to understand there function; identify a teaching procedure that allows us to efficiently and accurately train these tacts, and finally to measure the generalization of these tacts across settings, behaviours and individuals.

In order to be successful in school, work and in interpersonal relationships, individuals with ASD, like all members of a community, need to be skilled social communicator's. This need to communicate can be viewed as being linked to our identity as both an individual and a member of a group, to our control over our social self, and to our being accepted by our chosen social groups (Schutz & Wager, 1999). If it is true that the interactions within this social triad are a potent form of social reinforcement, and that this unique form of verbal behaviour arise because "one organism can be thought to be important to another as part of its environment" (Skinner, 1953; p.298), then it does seem reasonable to suggest that theses skills can be learned. Social reinforcement provides us with a sense of belonging to groups (e.g., identity), while providing us with a sense of involvement and acknowledgement. Additionally, control over these reinforcement contingencies helps determine to whom we speak and what we say, while our social acceptance can be seen as be directly linked to our desire to make friends, be liked and to fit in.

This investigation is directly concerned with our ability to shape and condition the reinforcing value of *private event*s (describing emotions and their causes), and to determine whether there is a reliable pedagological technology available to arrange "conditions under which a person describes the public or private world in which he lives" that can then generate "that very special form of behaving called knowing." (Skinner 1974; p. 34-35). Once a person's private world becomes important to others, it will come under the control of social reinforcement contingencies, being controlled by the behaviour called 'knowing'.

1.3 STRUCTURALISM VS. BEHVAIOURISM

1.3.1 Re-evaluating the Piaget-Skinner Debate

Any study of the contingencies which establish the verbal behaviour of the *private event* have been limited, both in the behavioural science as in the social sciences by what Piaget (1959) refers to as the prominence of the pre-socialized ego-centric language of the child.

> When a child utters phrases belonging to the first group [egocentric language], he does not bother to know whom he is speaking nor whether

> he is being listened to. He talks either for himself or for the pleasure of associating anyone who happens to be there with the activity of the moment ... he feels no desire to influence his hearer nor to tell him anything (p. 9).

The developmental argument proposed by Piaget suggests that the function of language for the child was initially egocentric, because the child would often speak about himself, while rarely attempting to place himself at the point of view of the listener (Piaget, 1959). The developmental explanation over simplifies the complexity of the problem of understanding the *private event*, by separating the child's language into either 'egocentric' or 'socialized' language. In egocentric speech, the child progressed from repetitive (*echolalic*) language, through to monologue, and on to dual or collective monologue, before developing socialized speech, which is defined by the class of adapted information, criticism, commands, requests, threats, questions and answers that they emit. The argument that the typically developing child will transition from the ego-centric to the socialized as the function of the language shifts from exciting the speaker to action, to communicating thoughts and feelings, is not all together inconsistent with Skinner's explanation, although it is inadequate to effectively explain the problems for the science of the language of "emotions".

Skinner (1957) re-addresses this by identifying at least four distinct problems for the study of the language of "emotions", all of which allude to the suggestion that a mixture of stimulus control responses are relevant, which is not always clear to the community, listener or the speaker. Equally, it could be argued that private stimuli may influence even the most objective of public events. Firstly, the connection between the *public* and *private event*s need not be invariable. Secondly, the collateral responses may be made to other stimuli, so that terms describing emotional states are under differing stimuli control from speaker to speaker. Thirdly, any metaphorical extension of the tact for the *private event* may follow unexpected properties, including the possibility that the reinforced response may be transferred to a *private event* by virtue of shared common properties. This would suggest that the verbal community would not need to appeal to the private stimuli directly, but could reach its goal through a process of abstraction. Finally, if the private stimulation is weak and unobserved by the verbal community, and yet remains strong enough to stimulate the behaver, there is no guarantee of the precision of control seen in response to external manipulable stimuli (Skinner, 1957).

The Skinnerian argument suggests that the verbal behaviour under the control of the private stimuli are effectively defective and cannot be trusted, whereas the developementalist view the link between emotion, behaviour and eventually words, as a process of mobilization. This processes enables the child to relate to the world more meaningfully, spontaneously and flexibly, gaining a firmer foundation for developing advanced cognitive skills (Greenspan & Weider, 1998). This argument appears consistent with the central question of this thesis, which queries the role a systematic instruction in *private events* would have on the social, emotional and language development of children with ASD.

1.3.2 Questioning the Validity of the Tact of the *Private Event*

It is not just the behaviourists who question the reliability of the language of the *private event*. Equally, the structuralists and developmentalists are unable to explain why people feel as they do, and agree only that there are common features amongst groups. Logical positivists or operationalists, argue that mental states are 'unobservable' and that there can be no truth by agreement, forcing investigators to abandon the examination of mental events (see Friedman, 1999 and Smith, 1986). The methodological behaviourists have ruled *private event*s out of bounds because there could be no public agreement about their validity (see Watson, 1924 and Zuriff, 1985), while the mentalists have shifted attention away from external antecedents, which might have explained the *private event*s, and have instead provided us with a set of inadequate vocabulary to define the event, and the study of emotion (see Chomsky, 1964). Contemporary thought from the behaviour analytic community suggests that a satisfactory explanation of the *private event* can only be achieved once a functional analysis of the antecedents and consequences associated with the language of "emotions" has been provided (see Palmer, Eshleman, Brandon, Layng, McDonough, Michael, Schoneberger, Steemer, Weitzamn & Normand, 2004). Indeed, we should not be dismissing the *private event* as subjective, but should instead be questioning both the nature of the object being observed and the reliability of the observation (Skinner, 1974).

We are then left with the suggestion, "that a small part of the universe is enclosed within the skin of each of us, and that this constitutes a private world to which each of us has a special kind of access," and that;

> It is presumably necessary to learn to observe or "know" events within this private world just as we learn to observe or "know external events, and our knowledge will consist of doing something about them... It is necessary to teach a child to distinguish between colours by presenting different colours and reinforcing his responses as right or wrong accordingly, but it is much more difficult to teach him to distinguish between different aches or pains, since the information as to whether his responses are right or wrong is much less reliable (Skinner, 1999; p. 317).

1.3.3 Emotions: How We Explain Our Inner World

Because of our limited accessibility to the world "within our skin", there has been much metaphysical speculation about what happens when we feel, and about how we tact this to our verbal community. In fact, the terms, which refer to our emotions, tend to be used inexactly, and have mostly been borrowed from descriptions of external events. Because the language of emotions has been shown to be metaphorical in origin, it is according to Skinner, an example "of the fictional causes to which we commonly attribute behaviour" (1953, p.160). Although the behaviour analytic approach has long embraced the analysis of emotions (Skinner, 1945), it has nonetheless been little studied. The reason for this is that "Skinner's epiphenomenal analysis held that emotions and overt behaviour emanated from the same source and thus an understanding of emotions was not necessary to an understanding of behaviour" (Hayes, Barnes-Holmes & Roche, 2001).

Equally, it has been argued by Friman, Hayes and Wilson (1998a; 1998b) that this argument is incorrect, and is instead based on a fundamental flaw in Skinner's analysis of verbal behaviour. They argue that emotional responses remain useful in detecting how verbal contingencies influence our behaviour, an idea that has gained additional attention in the developmental literature, where it is described as 'emotional intelligence' (Goleman, 1995). The "emotional intelligence" camp suggests that emotions may act as biological signatures, preparing the body for different kinds of responses (Ekman 1982; 1994), which are then shaped further by our life experience and our culture. Their argument suggests that anger, fear, happiness, love, surprise disgust and sadness, have both a universal biological foundation, and a functionality that is then moulded by culture, which has then played a critical role in the evolution of man.

As we dip into the more widely available literature and research into social behaviour, the *private event* and emotional development, we must first understand a bit more about what is inexactly defined as 'emotion' (Fehr & Russell, 1984; p. 464). James (1950) and Lange (1922), in the James-Lange Theory of Emotion, argued that emotions are caused by bodily sensation. Therefore, we do not feel the inner cause of emotion, but simply some part of the emotional behaviour itself, so that we may feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike or tremble because we are sorry, angry or fearful, as the cause may be. Equally, Skinner argues that emotions cannot be causes for behaviour, because they are dependent variables and are directly manipulable. At best emotions appear to be controlling variables that participate in an overall casual relation (Hayes & Brownstein, Zettle, Rosenfarb & Zorn, 1986).

Ultimately, emotions give meaning to our experiences and directions to our actions, enabling us to control our behaviour, sometimes referred to as self-regulation, and are often represented as the direct manipulation of feelings and states of mind (Skinner, 1974). Skinnerian theory here is consistent with the functionalist approach to emotion, which has argued that they are a central force in all aspects of human behaviour, where it expresses a readiness to establish, maintain and change our relationship to the environment (Berk, 2000; p. 398). In addition, componential theories of emotional development adopt a similar outlook as the 'emotional intelligence' theorists view that emotion is a universal, with a generic biological basis, consisting of patterns that reflect styles of life and socialization in the cultures from which they arise (Harre, 1986; Lang, 1988; Mesquita & Frijda, 1992; Ortony & Turner, 1990; Russell, 1978).

Greenspan and Wieder (1998) submit that there is little that we do or discuss that isn't cued by our emotions, while "the ability to link feelings with communication emerges gradually during the first year of life, and is readily apparent by the middle of the child's first year" (p. 109), although it is a shift that doesn't occur naturally for all individuals. Without this ability, to connect feelings and behaviour, complex communication tasks are made difficult if not impossible, which remains a primary deficit for children with ASD.

Overall, theories of basic emotion hold that specific emotions are universals, emerging from evolutionary selection, rather than a biological derivation. For typically developing individuals interactions with others can then be thought to generate emotional development, from a central biologically based 'start-up' programme, through to the evolution of the complex web that links our *private events* and emotions, to our social skills and language development. The interactions between our private world and our environment helps to explain the considerable individual and cultural differences that can be seen across individuals (Ekman, 1992a, 1992b; Levenson, Ekman, & Friesen, 1990; Oatley & Jenkins, 1996; Oatley & Johnson-Laird, 1987; Stein, Trabasso & Liwag, 1993; Tooby & Cosmides, 1990).

1.3.4 Understanding the Emotional World of Children with ASD

Children on the autistic spectrum are an extreme example of the disparity between the role of the 'start-up' programme, and the impact environmental shaping has on our emotional development. Whereas children with ASD appear to have a deficit with this capacity, remaining unable to link intent with affect, exemplifying an extreme example of the "male brain" (Baron-Cohen, 2003), there is no suggestion that they are not equipped with the biologically based basics of emotion. Behaviour analysis holds that "when the locus of control of the so-called 'emotional deficit' is not identified in terms of stimulus control, an individual is described as lacking in 'affect', whereas the response repertoires are more likely controlled by contingencies in the environment" (Greer, 2002; p. 275).

Indeed, individuals with ASD who do not appear to be able to understand emotional expressions (Hobson, 1986a, 1986b), not only exhibit an inability to enter into emotional relationships (Baron-Cohen, 1991, p. 385), but also appear to lack a mechanism which allows them to organize purposeful communication either with behaviour or words (Greenspan & Wieder, 1998; p. 108), suggesting that their is a problem with the range of reinforcers and punishers, which emerge as the individual's instructional history and learning experience evolves. It may also be that those who do not seek out others have a history that did not provide reinforcement opportunities from others (Greer, 1980).

Although children of 3-4 years old appear to understand that emotion can be caused by situations (Borke, 1971; Trabasso, Stein & Johnson, 1981) and desires (Wellman & Bartsch, 1988; Wellman & Woolley, 1990; Yuill, 1984); and that 4 - 6 year olds seem to understand that beliefs can effect emotion (Harris, Johnson, Hutton, Andrews, & Cooke, 1989), individuals with ASD appear to exhibit their most severe deficits at a primacy level, when matching photographs or drawn facial expressions, with video's of emotion related gestures or audio tapes of emotion related gestures (Hobson, 1986a), remaining unable to associate, transfer or generalize emotional experience. Despite this suggestion, Baron-Cohen (1991) has found that many individuals with ASD have passed the "Desire Test" (e.g. "Sally-Anne Test"), developing to the stage of understanding desire, paralleling what has been seen in normal development (Wellman & Woolley, 1990). In addition, Greenspan and colleagues (1997), have found that children who make good early progress were also able to develop the capacity to connect 'intent' or 'affect' to "motor planning and sequencing capacities to provide purpose, direction and meaning to behaviour" (p. 117).

Emotions are typically expressed through voice or gesture, beginning with a social smile, and expanding into a broader range of facial expressions and body language. Researchers have shown that autistic children often develop a social smile and joint attention later than typically developing children (Sigman, Mundy, Sherman, & Ungerer 1986; Stone, Ousley, Yoder, Hogan & Hepburn, 1997; Wetherby, Prizant & Hutcinson, 1998), show a more narrow range of facial expressions (Mesibov, Adams & Klinger, 1997; Dapretto, Davies, Pfeifer, Scott, Sigman, Bookheimer & Iacoboni, 2005), use more inappropriate facial expressions and emitted more negative expressions and fewer positive ones (Loveland, Tunali-Kotoski, Pearson, Brelsford, Ortegon & Chen, 1994; Yimiya, Kasari & Sigman, 2006). In addition, children with ASD have more flat or ambiguous expressions and are particularly lacking in positive affect during episodes of joint attention (Lord & Costello, 2005).

Children with ASD have sometimes been described as expressing emotions, particularly frustration and excitement, in 'unusual' ways, that often involve arm movements or the whole body, rather than socially acceptable facial expressions or vocalization seen in normally typically children (Carr & Kologinsky, 1983). They also fail to emit a "normal" range of vocal inflections associated with expressions of feelings or emotion, according to parent reports (Le Couteur, Rutter, Lord, Rios, Robertson, Holdgrafer & McLennan, 1989), and although these same parents were able to understand their own child, they struggled understanding the children of others. In contrast, parents of typically developing children were found to be able to identify the emotions of all normally developing children (Hooven, Gottman & Katz, 1995). This research suggests that children with ASD do have predictable ways of expressing emotion, although because they are idiosyncratic, they require learning to interpret as communication (Rick &Wing, 1976).

There is a cogent argument that emotions are linked to cognitive development and learning, although this remains controversial (Goleman, 1996, 1998; Petrides & Furnham, 2003), it might also be true that the emotional coding of events, which would have been acquired through experience, plays a significant role in guiding all learning. If as suggested, a bi-directionality between emotion and cognition does exist, then the importance of emotion to the learning process, with the very earliest emotional reaction possibly serving to establish learning, would be vital to the fulfilment of biological needs. By using children's emotions as a starting point for every interaction, a more efficient and mutually beneficial teaching technology should emerge, whereby by the child is taught to tact "I'm thirsty" as a means of manding "Drink, please." If this can be arranged, the question that must be asked is, could the emotional development of children provide researchers with important clues as to where to look for underlying biological mechanisms that control our cognition and learning?

Whereas much research on emotions has focused on the understanding and beliefs associated with, what Skinner refers to as "fictional causes to which we commonly attribute behaviour," (1953, p. 160), behaviourists have instead considered emotion as "a particular state of strengths and weaknesses in one or more responses induced by any one class of operations (Skinner, 1953, p. 166). In spite of this difference, both camps recognize that mentalistic investigations into emotion remains a necessary step in conceptualizing the problem of emotion as behaviour and the manipulable conditions under which behaviour is a function of verbal contingencies, and not as being one of the 'inner states' of the individual.

Early on in this debate, Skinner (1953) argued that emotion is most easily examined when put to practical use, and not to confuse the behaviour observed during an emotion with a hypothetical 'state,' "any more than eating is to be confused with hunger (an angry man and a hungry man, shows a disposition to act in a certain way)" (p. 168). Emotion thereby must involve learning to describe and to categorize one's own behaviour in ways that can be understood and reinforced in the wider verbal community.

Relational Frame Theory (RFT) proposes that "healthy emotional development involves learning to respond in accordance with relational networks, which contain emotional terms, in ways that overlap significantly with similar networks operating in the wider verbal community" (Hayes, Barnes-Holmes & Roche, 2001; p. 172). In turn, the language of emotions can be defined by the child, and by their uses, as "a rich and adaptable instrument for the realization of his intentions" (Halliday, 1973), such that the emotional responses emitted by the child have the power to influence the social and emotional behaviour of others, and in turn, the responses of the others can guide and shape the child's emotional and social development. In fact, increases in positive emotional expressions have been shown to improve learning on-task, while negative emotional expressions have had the opposite effect (Lewis, Sullivan, Ramsay & Alessandri, 1992).

Emotional experience enables us to build a sense of self, separate reality from fantasy, control impulses, and to become involved with peers and navigate the different stages of emotional, social and intellectual development (Greenspan &

Wieder, 1996). The language of emotions, and the conditions which generate it, are most easily studied when they are put to practical use, when it becomes social, or embedded in the language of social communication. Socialized speech, which sometimes uses what Piaget called "adapted information" (Piaget, 1959; p. 10), allows the child to exchange his thoughts and feelings with others, while requiring the speaker to take the point of view of the listener, so that the discussion centres around a topic that will both interest him and influence his actions through interchange, argument or collaboration.

1.4 SOCIAL & LANGUAGE SKILLS IN ASD

1.4.1 A Behaviour Analytic Approach

The parameters of social competence, involving both social language and social skills remains elusive, although it can be thought of as a synthesis of abilities which allow an individual to adapt social performance to different situations. This elusiveness is particularly true for children on the autistic spectrum, whereas they may be able to learn the conventions governing social interactions; they rarely enjoy the interaction (Baron-Cohen, 1991). Social behaviour might be defined as an individual's interest and ease in being with other people, which requires skills across domains of communication, motivation, imitation, and social knowledge (Lord, 1993; p. 62).

Skinner (1957) suggests that social behaviour "be defined as the behaviour of two or more people with respect to one another or in concert with respect to a common environment" (p. 297). A social skills model might argue that social behaviour is acquired by observing others, and that through modelling children can learn from the experience of others more quickly than they could in isolation

(Argyle, 1987). Our innate social instinct is at the heart of the individual psychology model of social behaviour, where the human desire to communicate is fuelled by our need to belong to a 'community' (Adler & Rodman, 1988). Alternatively, Maslow's theory of human motivation, place man's need to be social below their physiological and safety needs in a hierarchical model of development (Maslow, 1987). While in the transactional analysis model humans are essentially thought to be driven by the need to be acknowledged by others through physical or psychological recognition (Berne, 1975).

What these models recognize is that social behaviour is a valuable source of generalized reinforcement (Skinner, 1957; p. 299), and that intrinsic to verbal behaviour is some form of social reinforcement. Because one person is important to another person, social behaviour can be thought to have been shaped. Equally, it should be noted that "a good deal of our behaviour is reinforced by its effect on others, and it is presumably more reinforcing if the effect is clear" (Skinner, 1974; p. 193).

The main features of social communication, as defined by Hargie, Saunders and Dickson (1994), is that it is purposeful, determined, adaptable, coordinated and having the flexibility to be improved. Accordingly, these behaviours are then aimed towards an intended goal, can be influenced by the individual, require different skills for different situation, benefit from the integration of body language and verbal behaviour, and finally can be developed through practice and positive reinforcement. This view is consistent with Schutz & Wagner's (1999) view that the basic elements of social language are that they provide the individual with an identity, give the individual control and provide them with acceptance. Social communication is then multi-functional, affecting both the speaker and the listener, and can be viewed as a "rich and adaptable instrument for the realization of [his] intentions" (Halliday, 1973; p. 10).

Typically, children develop friendships through a set of skills that have been linked with overall intelligence (Berndt, 1996; Vaughn, Chard, Bryant, Coleman, Taylor & Linan-Thompson, 2000). While the majority of research concludes that early difficulties making friends and developing the social language competence required to form these bonds, results in an inability to form lasting and intimate friendships in later life (Stoneham, 2001). Although it is unclear whether the difficulties are simply because language skills are impoverished, or whether there are difficulties with the broader framework of peer interaction, it does seem clear that they are interlocking contingencies, and are therefore interdependent. What has been long recognized is that the social interaction deficit in children with ASD was pathogonomic to the disorder (Kanner, 1943; p. 43; Rutter, 1982, 1985), while Hermelin (1982) has put particular stress on the difficulty children with ASD have in utilizing and interpreting nonverbal communication (1982).

Skinner (1974) has written that behaviour analytic interventions should be used to produce environments where friendship and cooperation prevails. Historically, others (O'Leary & O'Leary, 1972) have argued that educators should look to the techniques of behaviour modification to help affective goals, while Lazarus (1973) has prompted the behaviourists to apply their technology to teach people "to emit forthright expressions of love, adoration, affection, appreciation and the specific verbal and nonverbal facets of compassion, tenderness, warmth, and other positive feelings." (Lazarus, 1971, p. 698).

Since then, a growing body of evidence to suggest that social behaviours can be brought under the control of contingent reinforcement has emerged, although there are no clear instructional guidelines in place to assist this process (Groden, 1982; Greenwood, Walker & Hops, 1977). Earlier studies have shown that infant smiling can be increased with contingent attention and other social reinforcers (Brackbill, 1958), as can cooperation (Azrin & Lindsley, 1956), and peer interaction (Kirby & Toler, 1970). Equally, modelling has also been used to increase the social behaviours of withdrawn children (Bandura, Ross & Ross, 1961; Rogers-Warren & Baer, 1976), while the combination of modelling and instruction has been shown to condition the similar behaviours (Cooke & Apolloni, 1976). In contrast to these findings, it has also been suggested that extrinsic reinforcers may interrupt these interactions (Strain & Shores, 1977), although peer confederates have been utilized successfully to assist children with ASD to develop social and play behaviours (McHale, 1983). This research suggests that play behaviours are better taught by typically developing children than by trained adults, while generalization would only occur if the target children were taught in integrated settings (Mesaros, 1984; Strain, 1983). This indicates, "heterogeneous environments (that is environments in which the majority of the individuals do not have the social deficits associated with ASD) are more likely to support positive social behaviours on the part of the persons with ASD" (Donnellan & Kilman, 1986; p. 215; Donnellan, Anderson & Mesaros, 1984). Although more recent research questions these findings (Reed, Osborne & Corness, 2007; Sheinkopf & Siegel, 1998; Eikeseth, Smith, Jahr & Eldevik, 2002; Gabriels, Hill, Pierce, Rogers & Wehner, 2001), it is nevertheless important to consider both the behaviour needing change, and the individual needs of the child, when design a social skills programme for a child with ASD.

Whether in a mainstream or a specialized setting, these reports offer tangible evidence that individuals with ASD can improve socially, and that social skills are not less amenable to remediation than cognitive and linguistic abilities. Instead, teaching children to engage in "natural" social interactions will require a more sophisticated use of behavioural strategies than has been applied in the past, with the support of the developmental information and functional assessments borrowed from interdisciplinary studies. Despite this understanding, education has traditionally neglected any systematic methods or strategies for promoting social skills (Borichm 1990; Morris, 1972; Hartup, 1970), which is particularly true in special education (Donnellan & Kilman, 1986; Morse, 1971). It can then be argued that it is not that our teaching technology that is faulty, but instead that it has not been sufficiently or appropriately tried.

1.4.2 Theory of Mind: A Hypothesis for the Nature of Social Deficits in ASD

A 'Theory of Mind', first proposed by Premack and Woodruff (1978), was defined as the ability to impute mental states to oneself and to others. In this definition, it represents one of the manifestations of a metarepresentational capacity, a mental state understanding, which is often considered part of an underlying cognitive mechanism independent of IQ (Hermelin & O'Connor, 1970; Frith, 1982; Rutter, 1983). This mechanism, "namely being able to conceive of mental states: that is, knowing that other people know, want, feel, or believe things" (Baron-Cohen, Leslie, & Frith, 1985; p.38), is thought to be crucial to social skills development. It is a component of social skills acquisition, which appears in typically developing children from the second year of life onwards (Bretherton, McNew & Beeghly-Smith, 1981; MacNamara, Baker & Olson, 1976; Shantz, 1983; Shultz, Wells & Sarda, 1980; Shutlz & Colghesy, 1981; Wimmer & Perner, 1983), and by the age of four can be measured by standard false belief tests (Perner, Leekam & Wimmer, 1987; Wimmer & Perner, 1983). In order to succeed at 'theory of mind', children have to be aware that different people can have different beliefs (Dennett, 1978). This "awareness" impairment is a core feature of ASD, resulting in an ability to develop normal social relationships (Baron-Cohen, 2003), or view the world from another perspective. Yet, it is "possible for autistic children to have a theory of mind and still exhibit incompetence, since social competence must depend on a large number of factors" (Baron-Cohen, et. al, 1985; p. 39), not just perspective taking.

The ability to see the world from the perspective of another person is, according to Piaget (1959) associated with socialized speech, whereas the pre-social language of the child is ego-centric "partly because the child speaks about himself, but chiefly because he does not attempt to place himself at the point of view of his hearer" (p. 9). Typically, young children hardly ever ask themselves whether they have been understood, instead uttering a 'collective monologue' that only resembles that of adults once the child is directly interested in making himself understood (Piaget, 1959). Children with ASD are thought not to have a 'theory of mind.' They therefore are unable to effectively 'mind read' the feelings of another person, or predict their behaviour, and instead remain locked in a state characterized by their 'collective monologues' (Wimmer & Perner, 1983).

'Theory of mind' would then be a prerequisite to having empathy or feeling sympathy for another person, so that an appropriate nonverbal or verbal emotional response to someone else's feelings might be emitted. Individual's with ASD typically show profound deficits in recognizing that emotions are caused by beliefs, rather than by situations and desires (Leslie, 1987, 1988), and are therefore defined by a rigid set of learned definitions for the language of emotions. Tager-Flusberg (1989) showed that although children with ASD can spontaneously produce terms describing mental states, in reference to basic emotions, they do not appear to associate these with beliefs affecting emotion. It is therefore dangerous to assume that if some emotions are within the range of understanding of people with ASD, that the primary role of the affective disorder in ASD is not relevant (Dawson, Galpert, Hill & Spencer, 1988; Snow, Hertzig & Shapiro, 1987; Yirmiyaa, Kasari, Sigman & Mundy, 1989).

Skinner (1974) has argued that although our knowledge of another person is limited by accessibility, not by nature or facts, the managed self will nonetheless alter his behaviour in such a way that it becomes either less aversive or more reinforcing to others. The behaviour analytic perspective might then propose that the individual "is not asked to examine his punitive feelings or to predict the feelings his behaviour would induce in others; he is to see whether it is the kind of consequence he would act to achieve." (p. 195). This is theoretically consistent with the 'regulatory model' of language, which suggests that language is used to regulate the behaviour of others (Halliday, 1973, 1975), and Piaget's (1959) 'adapted information's' stage of language development, where the "child adopts the point of view of his hearer, and when the later is not chosen at random" (p. 10-11) in order to achieve one's own goals.

Although perspective taking is widely recognized as both a conceptual and perceptual skill, using perspective taking (Shantz, 1983), there is also a suggestion that it may be part of a visual-spatial skills deficit (Robinson & Whiting, 2003; Hobson, 1991a; Hughes & Donaldson, 1979; Piaget & Inhelder, 1956). Nevertheless, 'theory of mind', which is generally believed to require the imputing of beliefs to others, remains a skill whose importance to our understanding of the nature and causes of ASD remains questionable. The distinction between the higher order mental state, required to maintain meaningful social relationships, and the cognitive abilities needed to take differing points of view in perceptual situations are likely to be different (Baron-Cohen, et. al., 1985). Investigators testing developmentally normal children have found differences in performance, from 85% passing a ToM test (Baron-Cohen, et.al., 1985) to a low of 41% (Wimmer & Perner, 1983), which may be the result of differences between tasks, materials, and language used to during the assessment (Grant, Grayson & Boucher, 2001), although it might also raise the question of how valid is the construct of Theory of Mind. Despite these concerns, tests of false beliefs remain key indicators for mentalizing abilities, with particular relevance to individuals with ASD, whose social-emotional disability appears intrinsically linked to their inability to successfully pass a 'theory of mind' test.

1.4.3 Language Development

When considering the form and function of the *private event*, the question of basic emotions, and the deficits children with ASD have with social skills and communication, we need too ask ourselves how language interacts with this triad. Bloom and Lahey (1978) ask the more general question of "What is language?" They answer their question with the observation that it's meaning varies, depending upon what one is interested in. Technically they define language as "a code whereby ideas about the world are represented through a conventional system of arbitrary signals for communication" (p. 4). Accordingly, successful manipulation of language would then require manipulations of those codes, ideas, conventions, and communications, all challenges faced by individuals with ASD.

Typical language development, including its use and understanding (*pragmatics* and *semantics*), are thought to be linked to the ideas or mental concepts that have been formed through experience (Bloom & Lahey, 1978). The experience of different objects can be thought to be an active process, whereby the similarities and differences between certain objects, help to build a structure and invariance in the environment (Gibson, 1966; Riegel, 1975). It is only after cognitive representations of objects, and object relations are formed that words or signs acquire meaning or form grammatically in relation to each other. The credibility of a universal grammar (Chomsky, 1972) is questioned and discredited in this model, while Skinner's *Verbal Behaviour* (1957) gains renewed vigour and significance. The behaviour analytic perspective (Skinner, 1957) proposes that language development is best defined in an operant model, where "the causes of the verbal behaviour of an individual are sought in the functions of the behaviour, and the causes of the similarities of behaviour between individuals are sought in similarities of functions of behaviour across individuals" (Risley, 1977; p. 82). The principles of operant conditioning describe the inter-relations of environmental events and verbal behaviour, while the cause of verbal behaviour is sought in the environmental events.

Atypical language development, can then be defined as not exhibiting the verbal behaviour that society is programmed to respond to, which would result in reduced contact with the contingencies that would either strengthen or maintain these behaviours. For children with ASD, it is unlikely that general conversation serves as a generalized conditioned reinforcer, and would require the use of other unconditioned reinforcers, including high levels of attention and approval to strengthen and maintain these behaviours (Gevirtz & Baer, 1958a,b), unlike the typically developing populations, which enhances the effectiveness of stimuli reinforcement through association with other already effective reinforcers (Kelleher & Gollub, 1962), thereby reducing variance in motivational states intrinsic to the limited availability of unconditioned reinforcers. Skinner (1957) distinguished between verbal behaviour that is maintained by reinforcers, usually unconditioned (mands) and those that are maintained by conditioned, generalized reinforcers (which is further divided into categories of echoic, textual, interaverbals, tacts, and autoclitics). Although the important effect of language, that the behaviour of the listener will in turn affect the behaviour of the speaker, remains the same.

Tacts for *private events*, reveal an emotional state to the listener in a socially relevant interaction, and can be maintained only if it functions as a conditioned reinforcer. It is therefore a complex form of behaviour, which is typically not reinforcing for the child with ASD. Complex language behaviours can then be thought to supersede the suggestion that word associations or rote learning could be solely responsible for their appearance (Staats, 1971), and suggest that this form of verbal behaviour can only be established and maintained as a conditioned reinforcer by being associated with a unconditioned reinforcer (Risley, 1977). Acquiring this form of verbal behaviour as a conditioned reinforcer, requires a technology that not only teaches the basic structures, but also encourages their generalization.

Imitation has been found to be an important component to teaching both nonverbal and verbal behaviours. Metz (1965) found that children with ASD began to emit approximate responses to novel behaviours after shaping simple imitative responses, while several investigators have extended this procedure to establish a response class of imitation to produce generative grammar (Baer, Peterson & Sherman, 1967; Whitehurst & Novak, 1973). Lutzker and Sherman (1971) demonstrated that typically developing toddlers could be taught the generative use of sentences with correct subject-verb agreement. Although Skinner (1974) reminds us that "speaking a language with the help of a dictionary and a grammar is not like speaking it through exposure to a verbal community" (p. 139), it is nevertheless an important consideration when developing an appropriate teaching strategy to mediate the lack of social affect in children with ASD.

With this understanding, the question remains as to whether children with ASD can mirror these findings, developing a repertoire of tacts for *private event*s through imitation, that can then function as generalized conditioned reinforcement, and equally, whether this will lead to generative grammatical structure. Most important to our understanding of language development, is that "the human species did not evolve because of inbuilt design: it evolved through selection under contingencies of survival, as the child's verbal behaviour evolves under the selective action of contingencies of reinforcement" (Skinner, 1974; p. 111). Risley (1977) offers the following explanation;

> The culturally determined functions of language are the aggregate of conditions that maintain the verbal behaviour of mature members of society. If these conditions are in part the differential reinforcement for the verbal behaviour that matches the characteristics of the society's verbal behaviour (be it phonemes, morphemes, grammar, inflections, rhythm, vocabulary or whatever), then the individual's verbal behaviour will stabilize in correspondence to these characteristics (p. 90).

1.4.4 The Role of Intrinsic and Extrinsic Reinforcement in Language Development

It is now commonly acknowledged that reinforcement contingencies (*extrinsic reinforcement*) maintain and modify complex human behaviour (Vollmer & Hackenberg, 2001), and is one of the most widely applied principals of behaviour (Northup, Vollmer, & Serrett, 1993). Social reinforcement, is perhaps the most frequently used type of reinforcement, can be thought of as a generalized conditioned reinforcer and punishment, "whose effectiveness is established and maintained through relation to other reinforcing and punishing events" (Vollmer & Hackenberg, 2001; pg 247). It has previously been shown that verbal approval is enhanced by the addition of smiles and physical contact (Kazdin & Klock, 1973); that behaviour specific verbal attention maintains higher levels of responding than irrelevant verbalizations (Fischer, Ninnes, Piazza & Owen-DeSchryver, 1996); and that when explicit reinforcement is paired with preferred objects, the reinforcing value of whole setting as enhanced (Hanley, Iwata & Lindberg, 1999); while it has also been shown that social consequences may also maintain problem behaviour (Iwata, Dorsey, Slifer, Bauman & Richman, 1994).

In contrast to the behaviour analytic argument that reinforcement contingencies maintain and shape behaviour, some theorists maintain that there is only a single kind of intrinsic motivation (*intrinsic reinforcement*), a motivation to engage in activities that enhance of maintain our self concept (Combs, 1982; Purkey & Schmidt, 1987; Purkey & Stanley, 1991). Their argument suggests that extrinsic reinforcement leads to short-range activity, while reducing long-range interest in a topic (Lepper & Hodell, 1989). Malone and Lepper (1987) have defined intrinsic motivation as what people will do without external inducement, engaging in the activity for no reward other than interest and enjoyment. This argument is consistent with *Self-Determination Theory*, which maintains that an "understanding of human motivations requires a consideration of innate psychological needs for competence, autonomy an relatedness" (Deci & Ryan, 2000; pg. 227).

The undermining effect of extrinsic reinforcement on intrinsic motivation remains contentious, as the construct validity, measurement reliability, experimental controls, and biased metareviews remain unresolved (Reiss, 2005). Still, the

Cognitive Evaluation Theory of motivation and reinforcement, argue that two systems operate parallel to each other; intrinsic reinforcement includes achievement, responsibility, & competence, while extrinsic, includes pay, promotion, feedback and conditions (Deci & Ryan, 1985; Ames & Ames, 1989). Intrinsically reinforced individuals perform for their own achievement and satisfaction, where extrinsic reinforcement can reduce an individual's intrinsic motivation, especially if this reinforcement is perceived as being controlled by other people (Deci & Ryan, 1985; 2000).

A number of unanswered question remain when considering the complexity of reinforcement contingencies, including: What are the number of unconditionedreinforcers? Which fundamental pursuits are interconnected? How many genetically distinct categories of reinforcement become functionally related to behaviour? And what are the connections between individual differences in reinforcement preference and "personality"? (Reiss, 2005). The complexity of these questions is intensified when applied to children with ASD, where the role *intrinsic* and *extrinsic* reinforcement (motivation) play in language and social development are confounded. In ASD, the failure to fully acquire normal language skills has been attributed to a lack of interest (e.g. *intrinsic motivation & reinforcement*) in learning itself (Waterhouse, 2002). Equally, the suggestion that there may be greater variation in developmental theory, and more inherent variation between individuals (Scarr, 1992), seen in the varying, fluid and complex patterns of social interaction (Maurice, 1993), may further impact where motivation and reinforcement is rooted (e.g. *intrinsic* vs. *extrinsic*) in children with ASD. Yet, there is little doubt that children with ASD require extrinsic reinforcement to learn new behaviours, and acquire new skills, although how this interacts with intrinsic reinforcement, and how this impacts on their ability to tact *private events*, remains a question of continued debate.

1.5 PLAY

1.5.1 Deficits in Imagination and Symbolic Play

The social emotional deficits implicit to ASD, the associated delays in imitation skills, and the difficulty children have with perspective taking (Theory of Mind), often referred to as the triad of impairments, are clearly manifested in their atypical imaginative and symbolic play behaviours. Typically developing children appear to be able to express a wide range of emotions in their play, while experimentation sometimes leads to an ability to predict some of their own feelings (Greenspan & Wieder, 1998), whereas children with ASD are often unable to 'play' with appropriateness or meaning. Play offers numerous opportunities to raise the subject of feelings, both their own and of others, particularly during pretend and symbolic play when a safe distance from 'self' can be achieved.

On a more fundamental level, "play forms the basis for imitating and maintaining social and emotional relationships throughout the preschool and elementary school years" (Stone & La Grecia, 1986), while providing a forum for learning and practicing cognitive and socialization skills. In early childhood it can be expected that children will learn responsiveness to others and reciprocity in peer interactions as social functions, while in middle childhood helping and cooperation behaviours emerge, playing an important role in subsequent peer relationships. Play skills mirror the continued cognitive and language developments (verbal fluency, symbolic thought and imaginative capacities) experienced by children (Piaget, 1962), and is reflected in series of play hierarchies which attempt to distil this observation.

1.5.2 Social Stages of Development in Play

In a seminal paper on social participation amongst pre-schoolers, Parten (1932) described a sequence of social stages associated with play, and social language development, which has served as the basis for much subsequent research. Young children were observed by Parten transitioning from solitary play (2 to 3 year old), to parallel play (2 to 3 year old), to associative play (3 to 4.5 year old) and finally witnessed participating in cooperative play (3 to 4.5 year old). Prerequisite to these stages included engaging in unoccupied behaviour and emitting onlooker behaviour. Parten noted that all types of play could be found at the preschool level, although differing degrees of social communication and interaction were not noted. To help delineate this, a five level peer-play scale was devised by Howe (1987), which was sensitive to the length of experience a child had with his peers rather than age. In this scale, level 1 saw children engaging in parallel play without eye contact, level 2 was marked by mutual regard, while level 3 saw simple social play with visual regard, level 4 consisted of complimentary or reciprocal action, gaze and awareness, and finally level 5 included both contingent social behaviours and complimentary actions (see Fein, Moorin & Enslein 1982).

The transformations between levels in these hierarchies remains an unanswered question, although the developmental literature does suggest that earlier play skills need to be mastered before children are taught later skills. Mutual visual regard, an ability to manipulate objects and to imitate is universal prerequisites for the mechanics of play, while communication skills are cited as the foundation of social interactions during play. Whereas Piaget (1926) suggested that until the age of 7 children displayed non-social language, Schmidt & Paris (1984) have challenged this arguing that distinct communication tasks become prominent at different ages, suggesting greater placidity to this skills development hierarchy. Children who present social communication and play deficits, which are particularly true of children with ASD, are likely to encounter increasing difficulty with social skills development as they grow older, because skills related to imitating and maintaining peer contacts were never formed (Greenspan, 2000).

For typically developing children in the elementary years, both nonverbal and verbal skills become increasingly more effective, developing a better ability to 'read' facial expressions, body movements, and voice intonation (Girgus & Wolf, 1975). Children that are successful learn to display an active interest in conversation (La Grecia & Santogrossi, 1980), stick to a topic and generate topics (La Grecia & Meisbov, 1981), ask questions (Minkin, Braukmann, Minkin, Timbers, Timber, Fixen, Philips & Wolf, 1976), and share information about oneself (La Grecia & Mesibov, 1981) during play and social interaction opportunities. In ASD, many of these milestones are never achieved, as children are often late beginners to speak and fail to develop nonverbal communication, while 50% never develop meaningful speech (Magiati & Howlin, 2003; National Research Council, 2001).

1.5.3 ASD and Play

Children with ASD spend less time in spontaneous functional play than their typically developing peers unless they are continuously supervised or instructed (Lewis & Butcher, 1988), engaging in off-task and inappropriate behaviours when direct instruction has been removed (Marholin & Steinman, 1977). When appropriate play levels fall, children with ASD engage in self-stimulation, illustrating a specific and reciprocal relationship between the two (Koegel, Firestone, Kranne & Dunlop, 1974). Researchers who have attempted to teach appropriate play to children with ASD (Coe, Matson, Fee, Manikam & Linarello, 1990; Haring & Lovinger, 1989; Romanczyk, Diament, Goren, Trunell & Harris, 1975; Santacarangelo, Dyer & Luce, 1987; and Schlein, Heyne & Berken, 1988), have found that the lack of independent play is a primary deficit with ASD, requiring the continual presence of the treatment provider to maintain long term generalized play (Schreibman, 1988).

As appropriate play behaviours are shaped, it would be expected that inappropriate toy use and self-stimulatory behaviours would decrease with a subsequent increase in social language. Using self-management strategies, Stahmer & Schreibman (1992) found that appropriate toy play in both supervised and unsupervised settings did increase. In this same study, generalization of appropriate behaviours occurred, while applying multiple exemplars was credited with increasing toy generalization for appropriate play (Stokes & Baer, 1977). As the toy play became reinforcing for the children, the strength of the natural contingencies for appropriate play may have been responsible for maintaining the behaviour. Just as self-management may have increased the likelihood that appropriate play was conditioned as a reinforcer, it may be true that contingent reinforcement and appropriate prompting could provide another explanation (Greer, 2002; Stahmer, 1995). Alternatively, children who have not found play to be reinforcing, may instead have acquired conditioned aversive control that impedes their overall progress, further extending the discussion of play and language development for children with ASD (Greer, 1991).

1.6 Methodology

1.6.1 Applied Behaviour Analysis

A growing body of research has suggested that individualized instruction benefits children with ASD, as their unique and complex needs are better addressed in environments, rather than in isolation (Burack, Root & Zigler, 1997; Mesibov, Schopler & Hearsey, 1994; Mesibov & Shea, 1996). Whether in a one-to-one setting, in paired work, or in a group setting, Applied Behaviour Analysis (ABA) provides a model for teaching children with ASD language, emotional/affective, cognitive & physical motor skills (Greer, 2002; Johnson & Layng, 1994; West & Young, 1992). Research has shown that children with ASD often struggle in typical environments (due to learning styles, developmental delays and sensory-perceptual difficulties) (Maurice, Green & Luce, 1996; Piek & Dyck, 2004; Quill, 1995), although many can learn with appropriate and intensive instruction. Whereas when the instruction is individualized it has resulted in better outcomes for students with ASD (Harris & Handleman, 1997; Hart & Risley, 1996).

ABA offers a highly individualized approach to teaching, and considers the set of behavioural deficits associated with ASD as ones that can be modelled and changed in response to clearly defined and carefully programmed interactions with the environment (Lovaas, 1981;Maurice, Green & Foxx, 2001; Maurice, Green & Luce, 1996). Proponents of the behavioural model argue that the most successful approach for individuals with ASD is behaviour analytic (DeMyer, Hingtgen & Jackson, 1981; Eikeseth, et. al., 2002; Lovaas, 1987; Sheinkopf & Siegel, 1998). No other treatment for autism has been tested to the extent that ABA has (Lovaas & Smith, 1989; Smith, 1993), which in the last 20 years has produced over two hundred research articles focusing on improving behavioural deficits observed in persons with ASD (Matson, Benavidez, Compton, Paclawskyj & Baglio, 1996).

The instructional and learning concepts and operations in ABA are individualized for each child, reflecting their unique learning styles, and have been empirically tested on children with different needs and backgrounds. In ABA, the concepts and applications are assessed on individuals across the spectrum of abilities (Greer, 2002), while behavioural methods to improve the educational, social and emotional outcomes of children with ASD have been a long history (Matson et al., 1996). Tactics that have been shown to improve the outcomes for children with autism include visual schedules (McClannahan & Krantz, 1999), Edmark Reading® (Anderson, Licht, Ullmann, Buck & Redd. 1979; Edmark Corp, 1992), picture communication systems (Charlop-Christy, Carpenter, Le, LeBlanc & Kellet, 2002), token economies (see Ayllon, 1999), reinforcement variation, reinforcer type and task variation (Egel, 1981; Rincover & Newsom, 1985; Weber & Thorpe, 1989).

A cornerstone of teaching as applied behaviour analysis is that instructional decisions are based on continuous measurement. Continuous measurement, leads to outcomes with greater accountability and creates opportunities for replication, by showing whether and when the behaviour is changing (Cooper, Heron & Heward, 1987; Greer, 2002). In addition, behaviour analytic environments aim to individualize all instruction, graph all measured data, use logically and empirically tested curricula and curricular sequences, while teaching educationally and socially significant repertories (Greer, 2002; Greer & Dorrow, 1976). A central tenant of ABA, is that it focuses on small, measurable units of behaviour (Lovaas, 1987; Sulzer-Azaroff & Mayer, 1977), which can be systematically observed, measured and taught. Although there are differing theoretical definitions of these units, including *discrete trail* (Lovaas, 1981), in this study the *Learn Unit*, a three-term interlocking contingency between student and teacher (Greer & Hogins, 1999) was the preferred definition. The *Learn Unit* is thought to be a measure that predicts learning (Albers & Greer, 1991), while providing verbally governed strategies, which help solve instructional problems through contingency analyses (Greer, 2002; pp. 36).

In ABA, the skills to be taught vary, and reflect the need of each child, ranging from simple (e.g. match same-with-same), to complex skills, (e.g. a conversational exchange). Choosing what to teach and when to teach, is part of the process of task analysis, where specific components of a target behaviour are identified and placed in order of occurrence including all the pre-requisite skills (Huguenin, Weiderman & Mulick, 1991).

1.6.2 The Foundations: A Framework for Investigation

This investigation is primarily interested with the form and function of tacts of *private event*s, which as a mode of verbal behaviour do not appear to differ from responses to the *public events* (*pure tacts*), and yet presents science with a series of problems due to their privacy (Skinner, 1957; p. 130). In addition, they have presented a unique challenge to the natural environment and pedagogy regarding how they can be effectively, accurately and efficiently shaped as a 'conditioned reinforcer' for both the speaker and the listener. Conditioned reinforcers typically develop as a result of an individual's experience with their environment, and are unique and ever changing for each individual. Although they may have originally been paired with other unconditioned reinforcers (food, drink, sleep) during conditioning, they are nevertheless unrelated to any biological need or structure (e.g.

unconditioned reinforcement), and serve primarily to strengthen the responses that immediately precede their delivery. Examples of almost universal conditioned reinforcement include social praise and attention (Copper, Heron & Heward, 1987).

In order for these tacts for *private events* to function as a potent conditioned reinforcer, they will require that the observer be able to identify the stimuli and to predict and control behaviour. In addition, the verbal community will be required to reinforce a given response in the presence of a given stimuli, which can not be done accurately, as a private stimulus cannot satisfy these conditions. Therefore, in order to overcome these limitations, the verbal community must establish contingencies of reinforcement, which produce verbal responses to private stimuli. Like any reliable study of human behaviour, this investigation needs to consider how to generate verbal behaviour with respect to a *private event* when there is no access to the required stimuli (Skinner, 1953, 1954, 1957).

Prior to teaching the form and function of tacts for *private events* to children with ASD, a number of prerequisites will need to be observed before an effective teaching model can be implemented. These prerequisites offer ways for the reinforcing community to generate verbal behaviour with respect to the *private event*, without having access to the private stimulus. Firstly, because the *private event* may be controlled by a common public accompaniment of the stimulus, a child should be taught to say "that hurts" by making reinforcement contingent upon the accompaniment of a painful stimulus (such as a blow or damage to tissue) (Skinner, 1957). The 'public accompaniment' is the observable behaviour associated with the *private event* that the natural environment is able to access, being the response to what happens inside that we see on the outside. Although there is no guarantee that these public accompaniments are an accurate reflection of the *private events*, they remain the natural environments only source of information about the internal event.

The second suggestion is that collateral responses to the *private events* should be established in the speaker, based on other responses that may have been witnessed (such that 'my tummy aches' may be reinforced when collateral behaviours such as holding the hand to the stomach, executing certain body positions or groaning in certain temporal patterns is observed by the verbal community) (Skinner, 1957). 'Collateral responses' are those responses that are emitted parallel to the target behaviour. In the example above, the 'tummy ache' is the target responses, while the other behaviours associated with the upset stomach, including the hand held to the stomach, facial expressions, and groaning are the collateral responses. The collateral responses offer the verbal community clues to the *private event*, but are effectively only when these 'other' responses have been established.

Thirdly, reinforcement of the *private event* may be transferred to a public stimulus by virtue of common properties, as in metaphorical or metonymical extensions. Such that we may describe a pain as sharp, or a sensation as burning after being pre-exposed to a sharp knife or a burning flame. Skinner (1957) argues, "the metaphorical step may have occurred before the response receded to the private world," and that "certain stimuli are frequently associated with objects having certain geometrical properties, and the response is therefore transferred from one to the other (p.132). Finally, when the description of the *private event* describes the speaker's own behaviour, "the original contingency may be based upon the externally observable behaviour of the organism, even though this stimulates the speaker and the community in different ways" (1957, p. 133).

1.6.3 Purpose of Research

This investigation tested the ability of children with autistic spectrum disorders (ASD) to tact *private events*, both their own and those of others, while measuring the subsequent relational outcomes in spontaneously emitted language interactions, engagement in inappropriate play behaviours and generalization to other forms of verbal behaviour. Ten school aged children, with diagnosis of ASD and communication disorders participated in a series of studies, designed to shape tacts for *private events* as conditioned reinforcers for non-preferred play activities, teach conversational skills based on observation and comment following schedule play tasks, and to mediate the implicit deficit in perspective taking associated with ASD.

Recognizing how another person feels remains one of the greatest challenges children with ASD face in developing social language and behaviour. This deficit makes it both difficult to build friendships and experience genuine empathy for others. In order to overcome this, children with ASD need to be taught to tact their own *private events*, and equally to tact the public correlates associated with the display of the 'emotions' of others.

The series of studies presented in this thesis investigated whether teaching children with ASD to tact *private events*, which could then form part of their functional communication programme, would result in increased levels of social language, decreased rates inappropriate behaviours, and finally in relational improvements across untrained *semantic* and *pragmatic* language behaviours. The first of these studies was designed to teach tacts for *private events*, which would function as conditioned reinforcers for teaching non-preferred play activities, resulting in increased levels of spontaneous language. A generalization probe followed this, to assess whether these children could then tact a *private event*s based on their own preferred and non-preferred activities.

The second of these studies was designed to teach children with ASD to initiate a conversation with a language partner, based on a tact for a *private event*, following play. The third in this series extended the goals of the previous design, to include more complex sentences, to include an agent, action *private event*, in a grammatically correct unit based on previously completed play activities. Both the second and third studies included a generalization probe across untrained stimuli. The forth study tested whether these same children could then tact the *private event* of another person (e.g. the public correlate of that behaviour), by first matching-to-sample emotions to situations (e.g. *the boy is having fun because it's his birthday*), being provided with multiple exemplar opportunities to learn (match, point, tact), before being asked to tact the *private event* of the target child. After mastery, a set new of situations were presented to the children to assess whether they could be taught to generalize these tacts to sets of novel situations, and to determine whether relational frame relationships had developed.

With a set of tacts for *private events* now well established in the children's repertoires, a final question, of whether children with ASD could tact changes in the expression of emotion, across *static* and *dynamic* stimuli. This study tested the participant's ability to tact the sequence of emotion cards (*static*), and then from videos' of these emotions changing (*dynamic*). A multiple baseline-reversal across subjects or behaviours was used in all of the studies, followed by a generalization probes across a sets of novel stimuli.

The results from these studies provides some evidence that suggests children with ASD can reliably be taught to tact *private event*s, both their own and the public correlates of others, which can lead to generative spontaneous language social language interactions, and reduce engagement in inappropriate behaviour repertories. Suggestions for future research and investigations are provided in the discussion, and possibilities for improving the methods used in this series of experiments are reviewed. Practical and theoretical implications and limitations are also summarized.

2 THE EFFECTS OF A CONVERSATION PROMPT PROCEDURE ON INDEPENDENT PLAY

2.1 Introduction

Delayed speech is a feature of children with Autistic Spectrum Disorder (ASD), with 50% remaining mute and socially isolated (Charlop & Haymes, 1994). Moreover, the inability to tact *private events*, and understand the meaning of social signals and mental states, often reduces the number of verbal exchanges that children with ASD will successfully engage in or initiate (Chin & Bernard-Opitz, 2000; Sigman, Kasari & Sigman, 1994; Sigman & Ruskin, 1999). Such *private events* have been shown to serve a pre-verbal social communication function in infants (Wagner & Lee, 2002), as affect extraversion in children (Slomkowski, Nelson, Dunn & Plomin, 1992), and as a means of positive affect and anger management (Robinson & Acevedo, 2001). Thus, the limited repertoires of appropriate social language in this population appears to increase the likelihood that such children will engage in inappropriate off-task behaviours, stereotypy, or escape/avoidance behaviours (Carr & Durrand, 1985; Durrand, 1993; Koegel & Frea, 1993; Mirenda, 1997; Scattone, Wilczynski, Edwards & Rabian, 2002; Sigafoos & Meikle, 1996).

The teaching of tacts for *private events* is a feature of mainstream Speech and Language Therapy (Bloom & Lahey, 1978), and developmental theory (Bolnck, Eisenberg, Spinard, Kupfer & Liew, 2006). Although behavioural interventions have long been used to increase speech in children with ASD (e.g., Hart & Risley, 1980: Koegel & Koegel, 1995; Krantz, Zalenski, Hall, Fenske & McClannahan 1981; Lovaas, 1981), the teaching of tacts for *private events* is often not addressed in typical home, or school-based, Applied Behaviour Analytic (ABA) programmes (Maurice, Green & Foxx, 2001; Maurice, Green & Luce, 1996), and remain awkward territory for the behaviour analyst.

In conventional ABA programmes, children are regularly taught sets of pure tacts (e.g., table, chair, book, drink), and to mand for desired reinforcers (e.g., drink, cuddle, crisps, play), and not to tact relevant *private events*, which is often a collateral gain of language development in typically developing children. One possible reason for this reluctance may be the suggestion that the contingencies that establish verbal behaviour are often defective, and a questioning of the scientific value of research on this form of emotional responses (see Skinner, 1945; 1957, p. 131; but see Friman, Wilson, & Hayes, 1998a, 1998b for a contrary view). Whatever the merits of these arguments, it appears practically important to develop an effective instructional operation to teach children with social-communication deficits to tact their emotions. If successful, this teaching operation could give children with ASD a greater understanding of the dynamic social function of verbal behaviour, while conditioning verbal behaviour as a potent reinforcer.

This study used an activity schedule to structure play sessions. An activity schedule is typically defined as being made up of a set of pictures, or words, that are used to cue children to engage in a sequence of activities, and which allows the children to complete the sets of activities without direct prompting or guidance (McClannahan & Krantz, 1999). In addition, a "conversation prompt" picture card was employed in the body of the activity schedule, in order to cue children to initiate a conversational unit based on a '*private event*'. Whereas it has been shown previously that the activity schedule can assist in the teaching of social interaction (Krantz & McClannahan, 1993; 1998), while reducing prompt dependency in children with ASD (McClannahan & Krantz, 1997), this study aimed to extend the utility by showing that it could also effectively be used to prompt a child to initiate a conversational unit, the topic of which was based upon the scheduled play activity just completed.

In teaching children to tact *private events* appropriately, the tact may well need to be shaped in the context of the conversational unit, which would include an interlocking speaker, listener, and a listener and speaker relationship. These units then link to other conversational units to form a conversation (Lodi & Greer, 1989). In such cases, a child might initiate a conversation, after being prompted with a visual cue to say: "puzzles fun" (speaker), from a choice between "fun" and "boring". This would be reinforced with: "I thought puzzles were fun as well".

The "conversation prompt" card would arguably impact the content of the conversation; just as setting events have been shown to influence the conversational unit, which controlled verbal behaviour (Donley & Greer, 1993). Together, the setting event and the conversational unit (based on tacts for *private events*) were central to this study's goal of teaching non-preferred play activities to children with ASD. By controlling setting events during the play session (mixing preferred and non-preferred play tasks in the "activity play schedule"), and through the introduction of the "conversation prompt," new play skills were shaped, and a subsequent reduction in aberrant behaviour, which included off-task play behaviour, inappropriate use of toys, avoidance, and escape, was achieved.

Although this study was designed to teach children to tact *private events* appropriately, it was also suggested that this new form of verbal behaviour might also function as a conditioned reinforcer, offering evidence that a reduction in aberrant behaviour can be a natural outcome of teaching children to engage appropriately in non-preferred play, replacing off-task behaviour with communication (Carr & Durrand, 1985; Durrand & Carr, 1991; Umbreit, Lane &

Dejud, 2004; Zuna & McDougall, 2003). By measuring the conversational unit across all preferred and non-preferred play activities, it was also hoped that the tacts for *private events* would not only functioned to reinforce engagement in these activities, but also condition a new set of generalized tacts that could be measured across other non-target activities and settings.

Thus, the present study had two main goals, to teach tacts for *private events*, which could then function as a form of generalized conditioned reinforcement to teach non-preferred play activities. In this multiple baseline study, preferred and non-preferred play tasks were included in an activity schedule, with conversation breaks between each activity (cued by "conversation prompt" cards), and tacting opportunities imbedded within each ten-minute play period. Tacts for "*fun*', "*boring*", "*easy*", and "*hard*" were introduced, and modeled for the children on a fixed one-minute schedule, with successive approximations being socially reinforced. It was hypothesized that these tacting opportunities would both condition the non-preferred play activities, thereby reducing inappropriate behaviours, and teaching new generalized tacts which would then form the basis of a new conversational unit, increasing spontaneous language.

To ensure that the improvements in play behaviour were a result of the tacts for *private events*, and not increased levels of generalized reinforcement, a non-contingent phase was introduced after the return-to-baseline, during which non-target behaviours were reinforced. During this phase, generalized tacts continued to be counted, to assess whether the tacts were under the control of specific, or non-specific, stimuli (Carr & Kologninsky, 1983; Matson, Sevin, Box, Francis & Sevin, 1993).

2.2 Method

2.2.1 Participants

Ten children (8 male and 2 female), between the ages of 5.3 and 8.9 (mean age = 6.9 years) participated in this study. All the participants were receiving home-based ABA instruction (designed as a component programme of the CABAS® systems approach to education, Greer, 2002), which also included part-time placements in mainstream and special education schools. All of the children had been diagnosed with ASD by an independent pediatrician, and had Gilliam Autism Rating Scale quotients of between 68 and 111 (see Table 2.1).

Table 2.1: Descriptive statistics of selected variables for participants, including age, GARS scores & speaker skills.

Participant	Autistic Quotient	Percentile Rank	Probability/Severity	Speaker Skills
Student 1 - M (5.3 yrs)	70	2%	Below Average	PECS
Student 2 - M (5.5 yrs)	85	16%	Below Average	Vocal Verbal
Student 3 - M (6.2 yrs)	100	50%	Average	PECS
Student 4 - M (5.8yrs)	68	1%	Very Low	PECS
Student 5 - M (7.2 yrs)	80	9%	Below Average	Vocal Verbal
Student 6 - F (5.3 yrs)	93	32%	Average	Vocal Verbal
Student 7 - M (5.3 yrs)	111	77%	Above Average	Vocal Verbal
Student 8 - M (8.7 yrs)	110	75%	Above Average	Vocal Verbal
Student 9 - M (6.4 yrs)	85	16%	Below Average	Vocal Verbal
Student 10 - F (8.9 yrs)	110	75%	Above Average	Makaton

Spontaneous initiations for all of the children were limited to a set of single word mands (e.g., "*drink*" or "*biscuit*", and included signs for "*more*" and "*finished*"). In addition, the children would point, and pull adults, to desired items or activities. None of the children would initiate an interaction with another child without prompting, and typically ignored the attempts of classmates and peers to engage them in even the simplest forms of interaction (e.g., eye contact). Multiple word phrases were infrequent, and were limited to "*I want*" and "*I want please*", although teachers, or parents, often prompted these responses. None of the children had ever observed, or commented, after an activity by saying that a task was "*fun*" or "*boring*", "*easy*" or "*hard*", or tacted other age appropriate *private events* (e.g., "*I'm tired*", or "*I'm happy*"). Pure tacts were limited to a list of identifications in response to the presentation of pictures, or objects, and as responses to the questions, such as: "*What is it?*" or "*What do you see?*" These behaviours were rarely generalized, or performed independently.

2.2.2 Setting and Materials

The research was conducted in each of the participants' homes, and was designed to be fully integrated into their home-based ABA programmes. Typically, each room where the training was conducted contained a work table, and a set of chairs, programme materials, and a book case, on which toys and reinforcers were clearly displayed in transparent bins, labeled with picture symbols for Duplo®, paints, puzzles, books, colouring, octagons, beads, playdoh®, glue and paper, etc. A schedule board was clearly displayed in each of the session rooms (PECS Schedule Board), and a set of colour symbols (2 inch by 2 inch), for each of the play activities with a Velcro® back, was arranged in a schedule book (Meyer-Johnson symbols). Conversational prompt cards were also displayed both in the play area, and on the worktable. These cards included two symbols representing tacts for *private events* (either "*fun*" and "*boring*", or "*easy*" and "*hard*"), and the symbols for "*yes*" and "*no*". The conversation prompt cards were designed to prompt the conversational unit, but also to verify the child's response.

2.2.3 Behaviour Definitions (Dependent Variables)

2.2.3.1 On and off task play: On task behaviour was defined as when the child was independently manipulating the play materials in an appropriate manner, and was engaged in the activity for the period under observation (rotation of a 5s observe and record for a total of 10 min). To be 'on task', the child was also required to remain within the designated play space, which was clearly defined on the floor (as a play rug, or tape outline), or sitting at the work table when appropriate (e.g., when painting, colouring, sticking, playdoh®).

'Off task' behaviour was defined as not using the materials in an appropriate manner (throwing, mouthing, ignoring, pushing away), or moving outside the limits of the designated area for the period under observation.

2.2.3.2 The Conversational Unit

The conversational unit was defined as a speaker-listener-speaker interaction, which included at least one of the selected tacts for *private events* (*fun, boring, easy*, or *hard*). Each unit was defined as a child pointing to one of the picture symbols, displayed on the conversation prompt cards, both during play, and after play, or using the appropriate sign or vocalization for these tacts. This was followed by the instructor "listening" to the child's initiation, and responding in turn. Alternatively, the conversational unit could have begun with the instructor tacting a *private event*, followed by the child "listening" to this tact, and, in turn, responding with their own tact.

Conversation prompt cards were designed to include two symbols for tacts (e.g., "*fun*" and "*boring*", and "*easy*" and "*hard*"), and the words "*yes*" and "*no*". Each time the child pointed at one of the symbols, this was scored as a communicative response, and this was always followed by a question of confirmation, which was scored to verify that the child's emitted tact matched the child's perception of the meaning of the *private event.*

A typical conversation might be as follows: the child points to "*fun*", while playing with Duplo®, to which the teacher listens, and responds, "*I think puzzles are fun as well!*" (Speaker-listener-speaker). This conversation is then followed by the teacher confirming the child's response by asking the child: "*Did you think puzzles were fun?*", to which the child answers either "*yes*" or "*no*".

2.2.3.3 Unique Symbol Use, Signing, or Vocalizing

These events were defined as all non-target signs, symbols, exchanges, or vocalizations, used by the child, other than those being shaped, or in generalized use, and occurring either within or outside the Learn Unit. These behaviours included both elaborations (e.g., "the puzzle is big", "I was fast", "the colour is red", etc.), and unscripted interactions (e.g., "I hear mummy", "trains next", "it fell"), and were only measured during each of the 10 min play sessions.

2.2.4 Experimental Design and Measurement

A multiple baseline across behaviours, followed by a full reversal (ABCAD), was used to determine whether the conversational prompt procedure could shape non-preferred play activities, while teaching a set of generative tacts for *private events*. Data sheets were separated out for each of the play activities, with space for 60 alternating 5s periods of observation to be scored as 'on-task', or 'off-task', and which included columns for the measurement of the conversational unit, and for recording the spontaneous use of symbols, signs, and vocalizations, recorded as an individual event. Each conversational unit was considered a Learn Unit (see Greer & Hogin, 1999), defined as a three-term interlocking contingency between child and teacher, which included an antecedent, a behaviour, and a response for both the child and the teacher.

2.2.4.1 Activity Preference Test:

Table 2.2: Preference assessment results for preferred and non-preferred play activities across the ten participants.

	Preferred play activities		
	1st	2nd	3rd
Subject 1	Puzzles	Books	Story
Subject 2	Puzzles	Books	Story
Subject 3	Puzzles	Lego	Trains
Subject 4	Trains	Books	Story
Subject 5	Lego	Puzzles	Octagons
Subject 6	Puzzles	Lego	Painting
Subject 7	Puzzles	Trains	Books
Subject 8	Colouring	Books	Dolls
Subject 9	Puzzles	Lego	Books
Subject 10	Story	Playdoh	Colouring

	Non-preferred play activities		
	1st	2nd	3rd
Subject 1	Colouring	Octagons	Duplo
Subject 2	Playdoh	Painting	Duplo
Subject 3	Playdoh	Colouring	Painting
Subject 4	Puzzles	Duplo	Colouring
Subject 5	Playdoh	Cars	Dressing Up
Subject 6	Cars	Dressing Up	Colouring
Subject 7	Lego	Colouring	Playdoh
Subject 8	Lego	Moblio	Puzzles
Subject 9	Colouring	Moblio	Playmobile
Subject 10	Dressing Up	Playmobile	Moblio

Before beginning the experiment, a stimulus preference procedure was used to determine which of the six play activities were preferred, and which were non-preferred (e.g., Carr, Nicholson, & Higbee, 2000; Windsor, Piche & Locke, 1994). During a 10-trial exposure, the children were asked to choose a play activity that they wanted to engage in from a selection of six alternative activities. After completing the activity for a period of five minutes, they were asked what they wanted to do next. This procedure was followed until all six activities had been selected. The order in which each child selected the activities was recorded, and, after the trial period, the three activities that were most often asked for as the first, second, and third choice, were grouped together as the preferred activities. The remaining three activities were grouped together as the non-preferred activities (see Table 2.2).

The selection of the six activities was based on play activities already in each of the children's home programmes, and included those activities that had met criterion and those having difficulty meeting (criteria was defined as 90% accuracy across three consecutive sessions).

2.2.5 Baseline

During baseline, a measure of 'on-task' and 'off-task' play behaviour was recorded. For each 5s interval, a plus or minus was scored, based on the previously defined criteria, on the appropriate data sheet. Each play activity was measured for a total of 10 min. Each 5s interval represented one Learn Unit (of antecedent-behaviour-response). Reinforcement was delivered on a fixed 10s schedule, with praise, including both social, and behaviour-specific, once every 10s. Event recording was used to measure all spontaneous vocalizations, attempts at signing, or the use of the individual picture symbol systems. Each attempt was scored as a plus in the appropriate column on the data sheet.

Sessions were run by ABA teachers with a minimum of one year's experience teaching in ABA home programmes, and the parents participating in a parent education programme. All training and teaching sessions were supervised by a senior ABA Behaviour Analyst. Sessions were conducted between three and six times per day, for a period of 10 min each, five days per week.

During baseline, the child was also requested to organize their activity schedules for their play sessions. The schedule included the three targeted, and the three non-targeted, play activities (three non-preferred and three preferred).

2.2.6 Teaching

During the teaching phase, the baseline conditions were maintained, but there was an addition of the conversational prompt procedure. This procedure was designed to prompt the conversational unit, by modeling an appropriate initiation (speaker-listener-speaker) on a 1-min schedule, during each of the 10-min activities. To do so, the teacher would initiate a 'conversation' by telling the child that they thought an activity was either "*fun*" or "*easy*" (each conversation was vocalized, as well as signed, or presented as a picture symbol, where appropriate). After this initiation, the child was offered the opportunity to respond (using the conversation prompt cards) by telling the teacher that the task was either "*fun*" or "*boring*", "*easy*" or "*hard*". Instruction was maintained until three consecutive sessions of 100% correct responding ('on-task' play) was achieved.

2.2.7 Independent Play

Following the teaching phase, an independent play phase was introduced to measure whether the conversation prompt cards would cue the child to initiate a conversation after the play activity had been completed. During this phase, the conversation cards were included in the play schedule between each of the play tasks, and were not immediately available in the play area, as during the teaching phase (either on the floor, or at the table). Baseline measurements were again maintained during this phase.

In following the play schedule, each child was taught to remove the first play symbol from the schedule board, collect their materials, play for 10 min, and, after tidying up, return their activity symbol to the finished box at the bottom of the play schedule. Upon following these steps, the next activity could be removed from the play schedule in sequence. During this phase, the conversation prompt card was placed between each of the play activities, as a means of prompting the desired conversation. Upon completing the play activity, the child removed the conversation card, cueing them to tact that the previous activity was either "*fun*" or "*boring*", "*easy*" or "*hard*". The instructor would listen to this tact, and then respond (completing the speaker-listener-speaker unit). Following these 'conversations', the instructor initiated an intra-verbal, by asking the child to confirm their previous tact (i.e., "*Did you think puzzles were fun?*"), to which the child responded "*yes*" or "*no*". This phase was maintained for a minimum of 10 sessions, for each of the six targeted play activities.

2.2.8 Return-to-Baseline

In the return-to-baseline phase, the conversation cards were removed from the play schedule, and measures of 'on-task' and 'off-task' behaviours for each of the six play activities were again taken. As in the baseline phase, a measure of a plus, or a minus, for each 5s interval was recorded, for each 10 min period. Reinforcement was again delivered on a fixed 10s schedule, and included both social, and behaviour-specific, praise. All spontaneous vocalizations, attempts at signing, or use of the individual picture symbol systems, were also measured as individual events. During the return-to-baseline, the child was also required to organize their individual play activity schedules, which included all three of the target tasks (the non-preferred play activities).

2.2.9 Non-Contingent

A non-contingent phase was introduced, as a final phase, to assess whether the increases in appropriate behaviour could be attributed to changes in reinforcement that would have occurred with the introduction of the conversation cues. During this phase behaviours other than those being measured were reinforced, while the same measure of 'on-task', and 'off-task', play behaviour was taken as during the independent phase, on an alternate 5s interval schedule was maintained.

2.2.10 Inter-observer Agreement

Table 2.3: Inter-observer agreement for preferred play activities and the corresponding vocalizations.

Inter-observer Agreement: Preferred Play

	Baseline	Teaching	Independent	Return/BL	Non-contingent
Student 1	0.98	1.0	0.86	0.98	0.79
Student 2	0.78	0.93	0.85	0.89	0.98
Student 3	0.84	0.95	0.98	0.95	0.86
Student 4	1.0	0.93	0.78	0.94	0.97
Student 5	1.0	0.96	0.92	0.98	0.86
Student 6	0.92	1.0	0.87	0.98	0.82
Student 7	0.96	0.95	0.96	0.84	0.89
Student 8	0.83	0.95	0.98	1.0	0.85
Student 9	0.85	0.92	1.0	1.0	0.95
Student 10	0.86	0.98	0.84	0.97	0.98

Inter-observer Agreement: Preferred Play/ Vocalizations

	Baseline	Teaching	Independent	Return/BL	Non-contingent
Student 1	0.98	0.88	0.98	0.87	0.92
Student 2	0.96	0.98	0.98	0.96	0.98
Student 3	1.0	0.98	1.0	0.78	1.0
Student 4	1.0	0.96	0.87	0.98	0.98
Student 5	0.92	0.89	0.92	1.0	0.78
Student 6	0.89	1.0	0.88	0.89	0.84
Student 7	0.98	0.92	1.0	0.92	0.87
Student 8	0.87	0.96	0.78	0.87	1.0
Student 9	0.94	0.98	0.98	0.98	1.0
Student 10	0.96	0.86	0.89	0.92	0.98

Inter-observer agreement was calculated using Cohen's Kappa to control for chance agreements, calculated across 10% of the sessions for each of the children. This score had a range across participants of between 0.78 and 1.0. The Cohen's Kappa for the Preferred Play, during Baseline ranged, across the participants, from

0.78 to 1.0; for Phase 1, from 0.92 to 1.0; for Phase 2, it was between 0.78 and 1.0; for the Return-to-Baseline, it was between 0.84 and 1.0; and for the Non-contingent phase from 0.79 to 0.98. Agreement for Vocalization during Preferred Play, during Baseline, ranged across the participants from 0.87 to 1.0; for Phase 1, it ranged from 0.86 to 1.0; for Phase 2, between 0.78 and 1.0; for the Return-to-Baseline, between 0.78 and 1.0; and for the Non-contingent phase, it ranged from 0.78 to 1.0 (see Table 2.3).

Table 2.4: Inter-observer agreement for non-preferred play activities and corresponding vocalizations.

Inter-observer Agreement: Non-preferred Play

	Baseline	Teaching	Independent	Return/BL	Non-contingent
Student 1	0.98	0.96	1.0	0.89	0.79
Student 2	0.98	0.89	0.96	0.98	1.0
Student 3	0.96	1.0	0.95	1.0	0.89
Student 4	0.92	0.94	0.97	0.95	1.0
Student 5	0.97	1.0	0.89	0.96	0.94
Student 6	0.98	0.98	0.94	1.0	1.0
Student 7	1.0	0.92	0.86	0.97	0.94
Student 8	0.87	0.91	0.82	0.87	0.78
Student 9	0.94	1.0	0.98	0.92	1.0
Student 10	0.86	0.98	0.98	0.93	0.95

Inter-observer Agreement: Non-preferred Play/ Vocalizations

	Baseline	Teaching	Independent	Return/BL	Non-contingent
Student 1	0.89	1.0	0.98	0.97	0.97
Student 2	0.98	0.93	0.98	0.98	0.95
Student 3	0.92	0.89	1.0	0.93	0.86
Student 4	0.87	0.87	0.98	0.87	0.82
Student 5	1.0	0.98	0.86	0.94	0.89
Student 6	0.94	0.98	0.89	0.98	1.0
Student 7	0.96	0.93	1.0	0.98	0.98
Student 8	1.0	0.94	0.98	0.89	0.95
Student 9	0.98	1.0	0.94	0.78	0.98
Student 10	0.94	0.89	0.98	0.98	0.87

The Cohen's Kappa for the Non-Preferred Play, during Baseline, ranged across the participants from 0.86 to 1.0; for Phase 1, it ranged from 0.89 to 1.0; for Phase 2, between 0.86 and 1.0; for the Return-to-Baseline, between 0.87 and 1.0; and for the Non-contingent phase, it ranged from 0.78 to 0.98. Agreement for Vocalization during Non-Preferred Play, during Baseline, ranged across the participants from 0.87 to 1.0; for Phase 1, it ranged from 0.87 to 1.0; for Phase 2, from 0.86 to 1.0; for Return-to-Baseline, it ranged across participants from 0.78 to 0.98; and for the Non-contingent phase, it ranged from 0.87 to 1.0 (see table 2.4). Thus, agreement was high for all participants in all phases of the study.

2.3 Results

Figure 2.1: Student 1 Non-preferred play and vocalizations, signs or PSS.

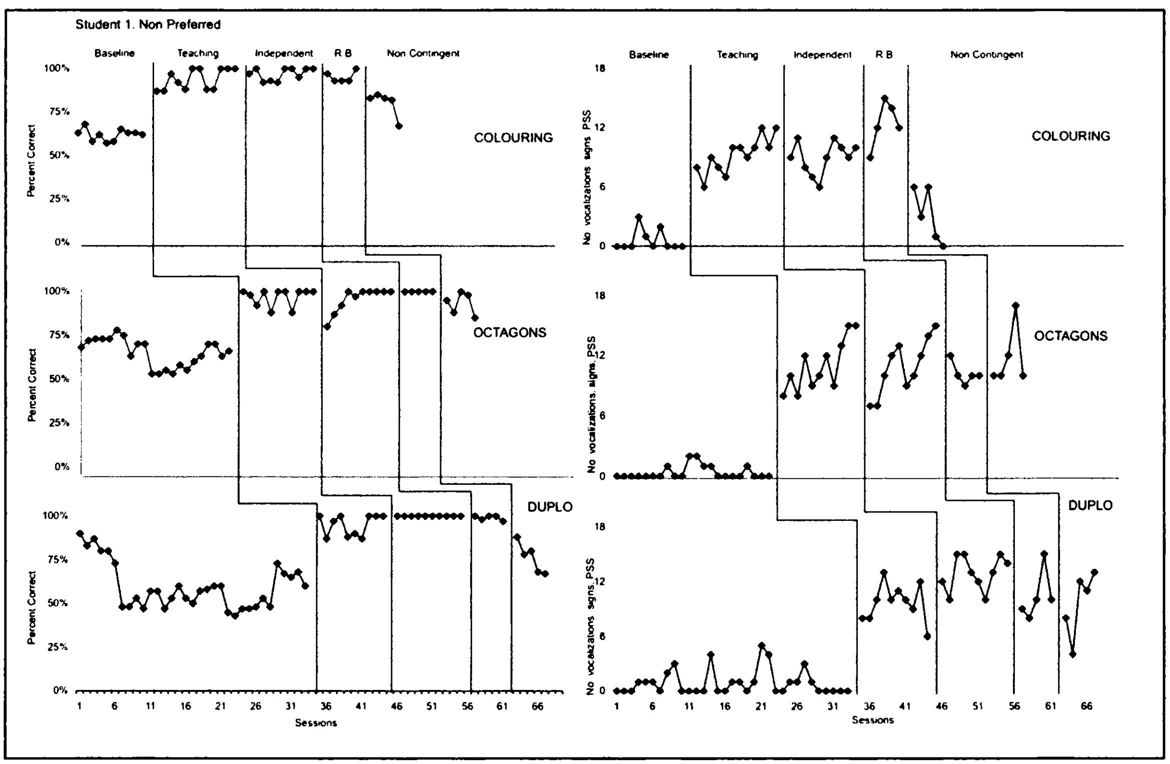


Figure 2.2: Student 1 Preferred play and vocalizations, signs or PSS.

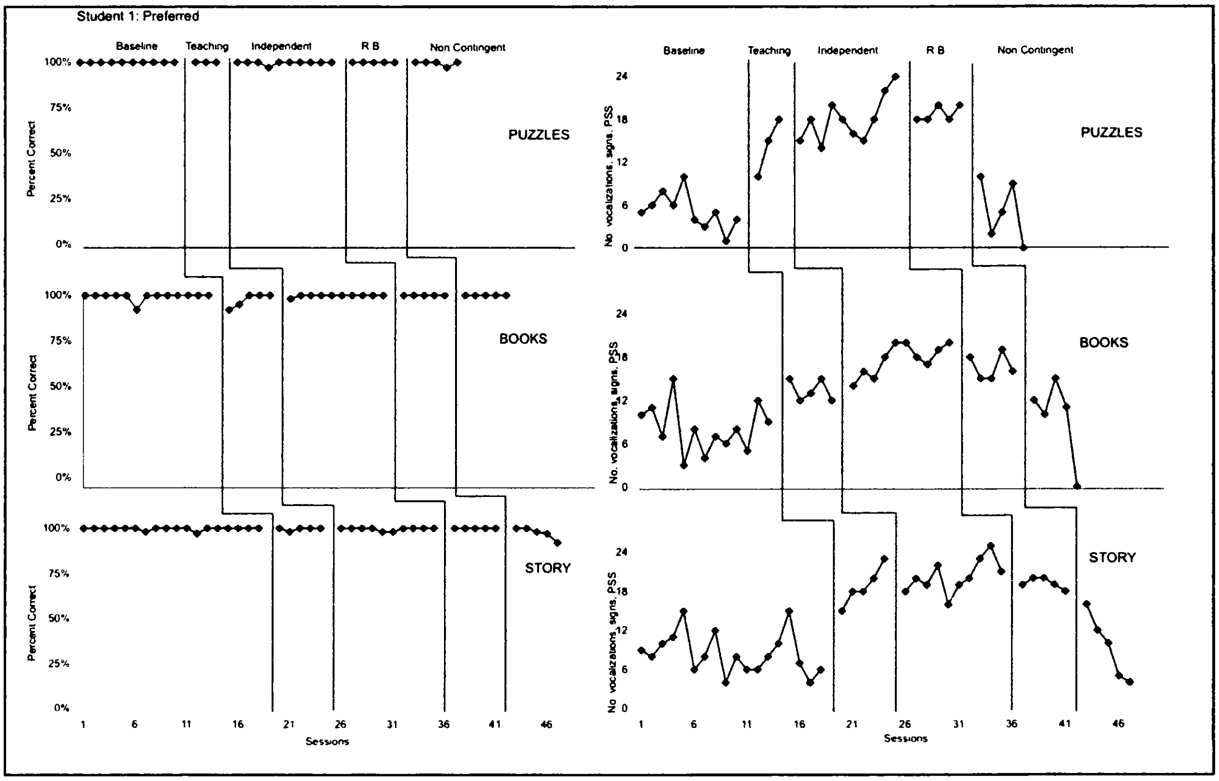


Figure 2.3: Student 2 Non-preferred play and vocalizations, signs or PSS.

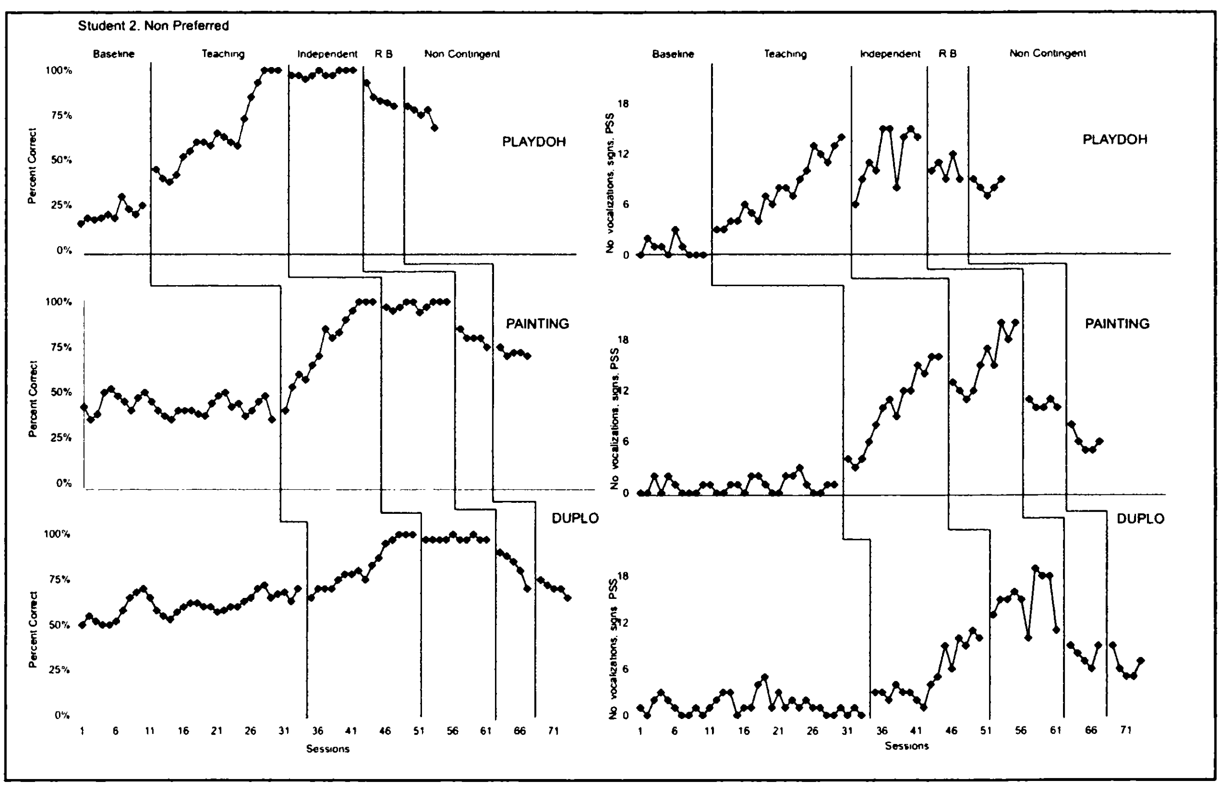


Figure 2.4: Student 2 Preferred play and vocalizations, signs or PSS.

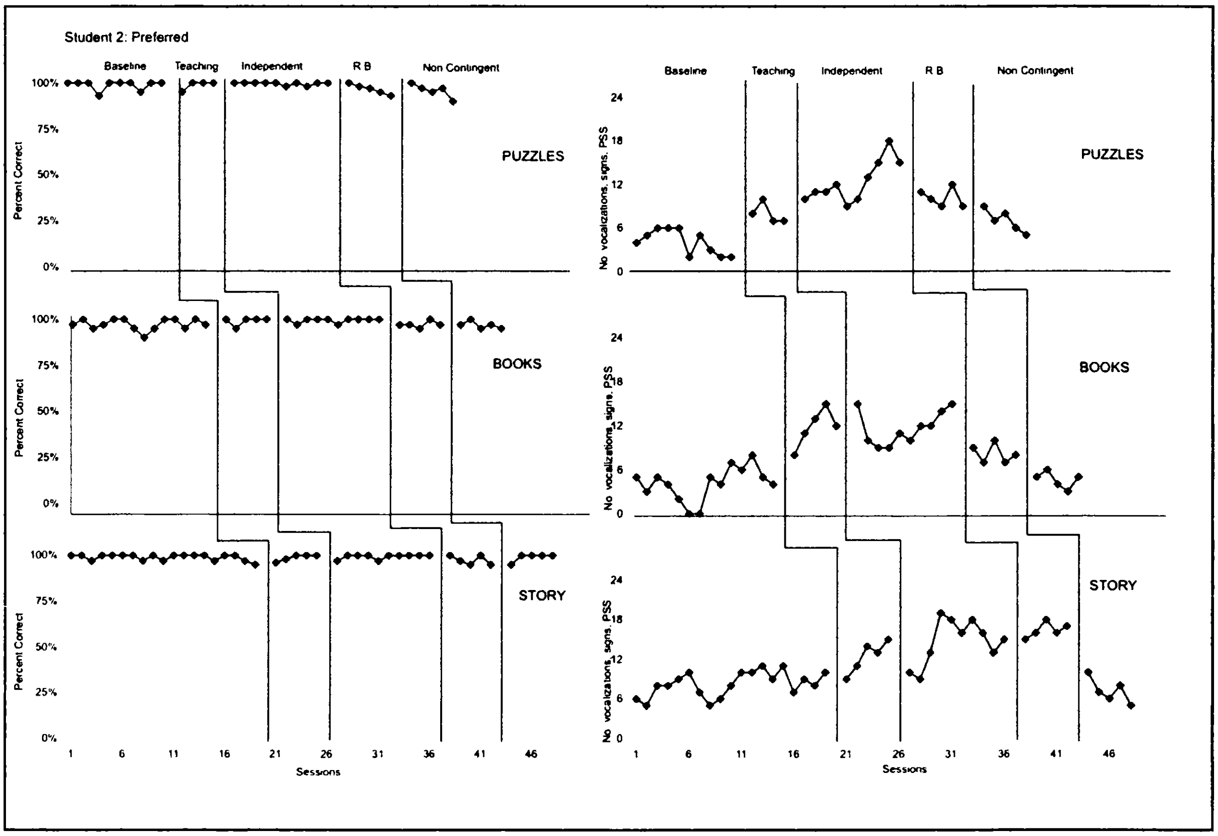


Figure 2.5: Student 3 Non-preferred play and vocalizations, signs or PSS.

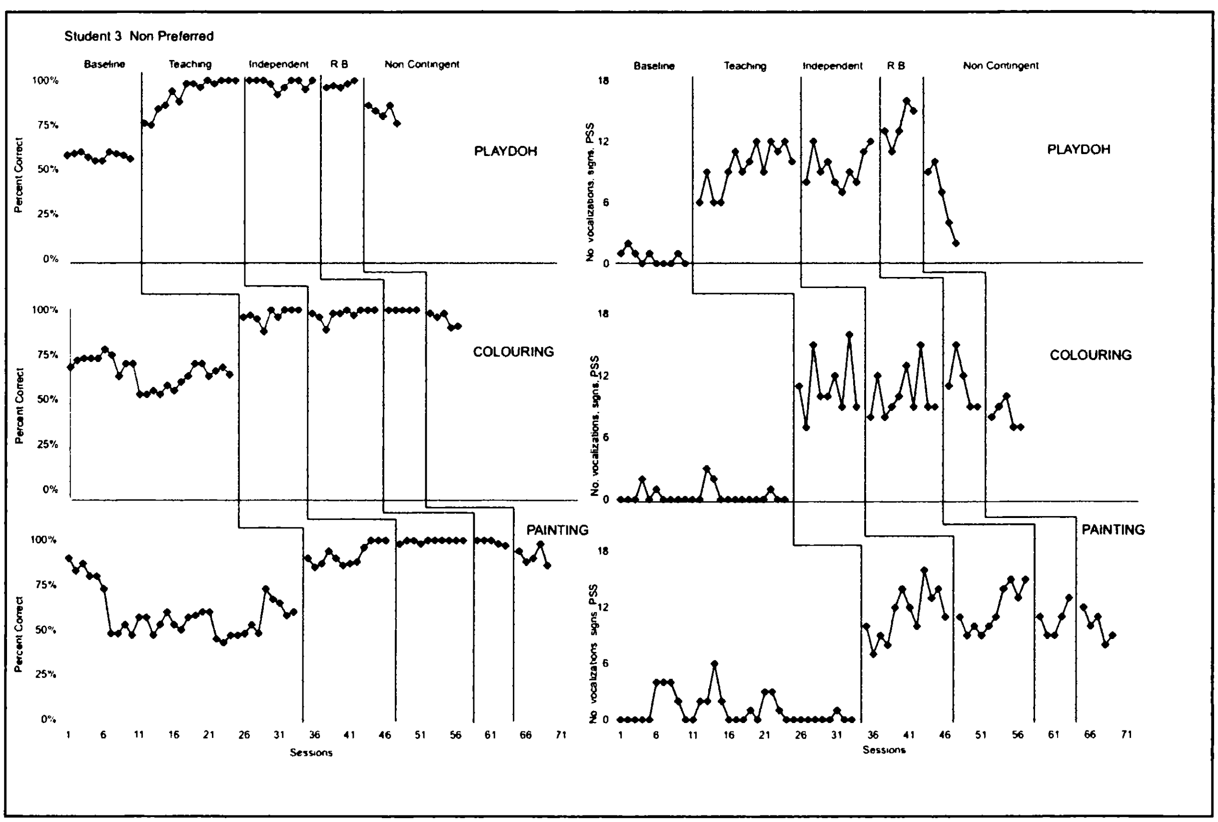


Figure 2.6: Student 3 Preferred play and vocalizations, signs or PSS.

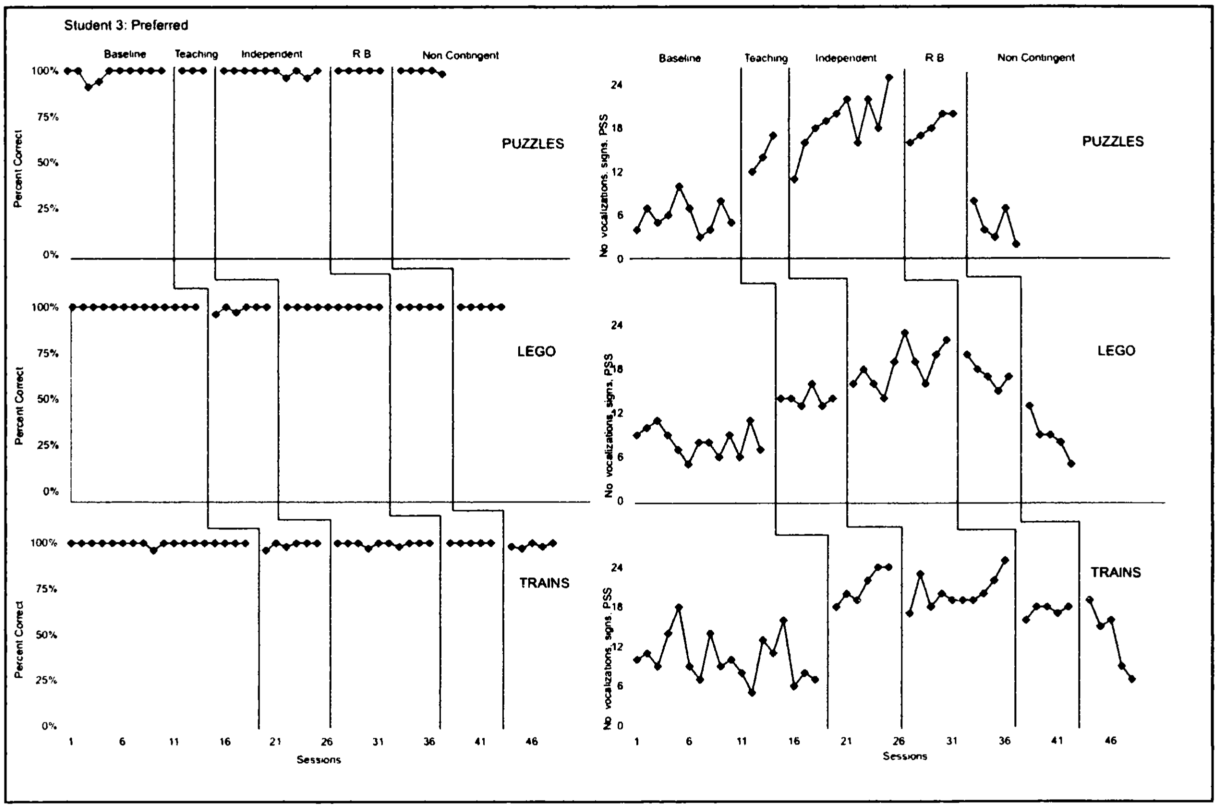


Figure 2.7: Student 4 Non-preferred play and vocalizations, signs or PSS.

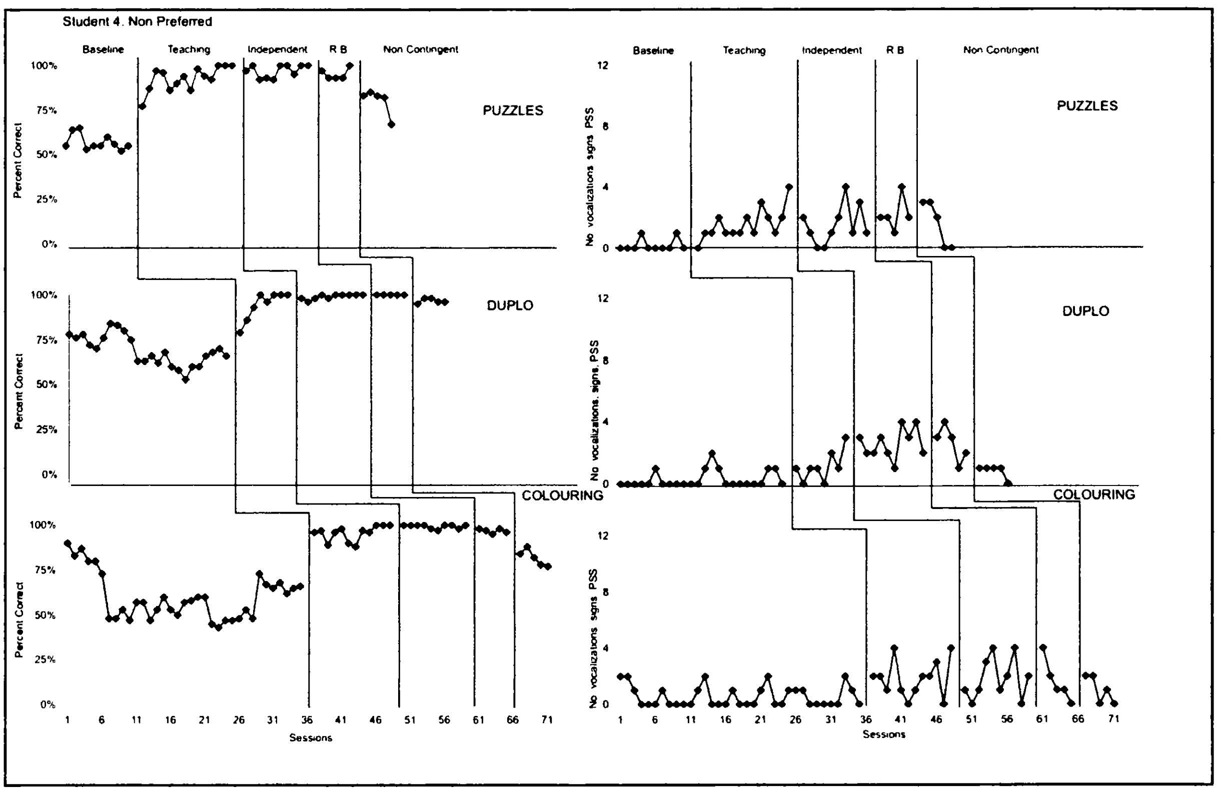


Figure 2.8: Student 4 Preferred play and vocalizations, signs or PSS.

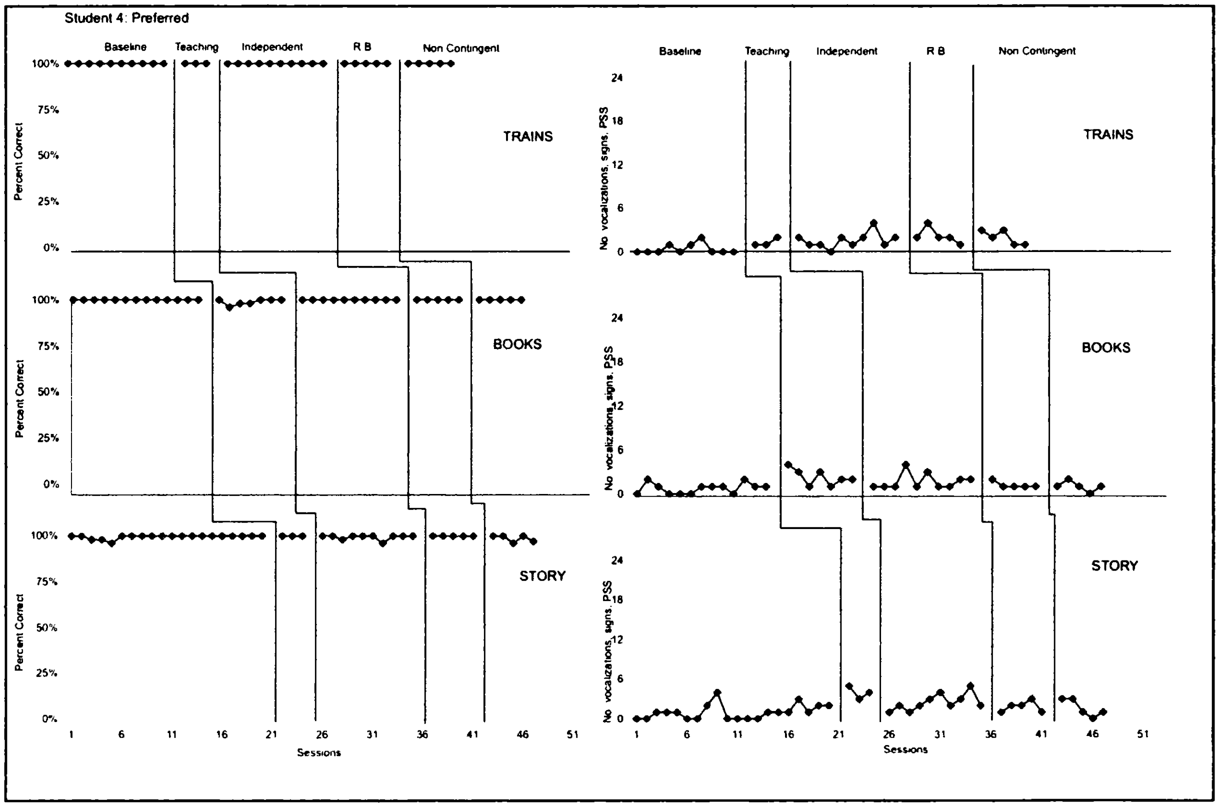


Figure 2.9: Student 5 Non-preferred play and vocalizations, signs or PSS.

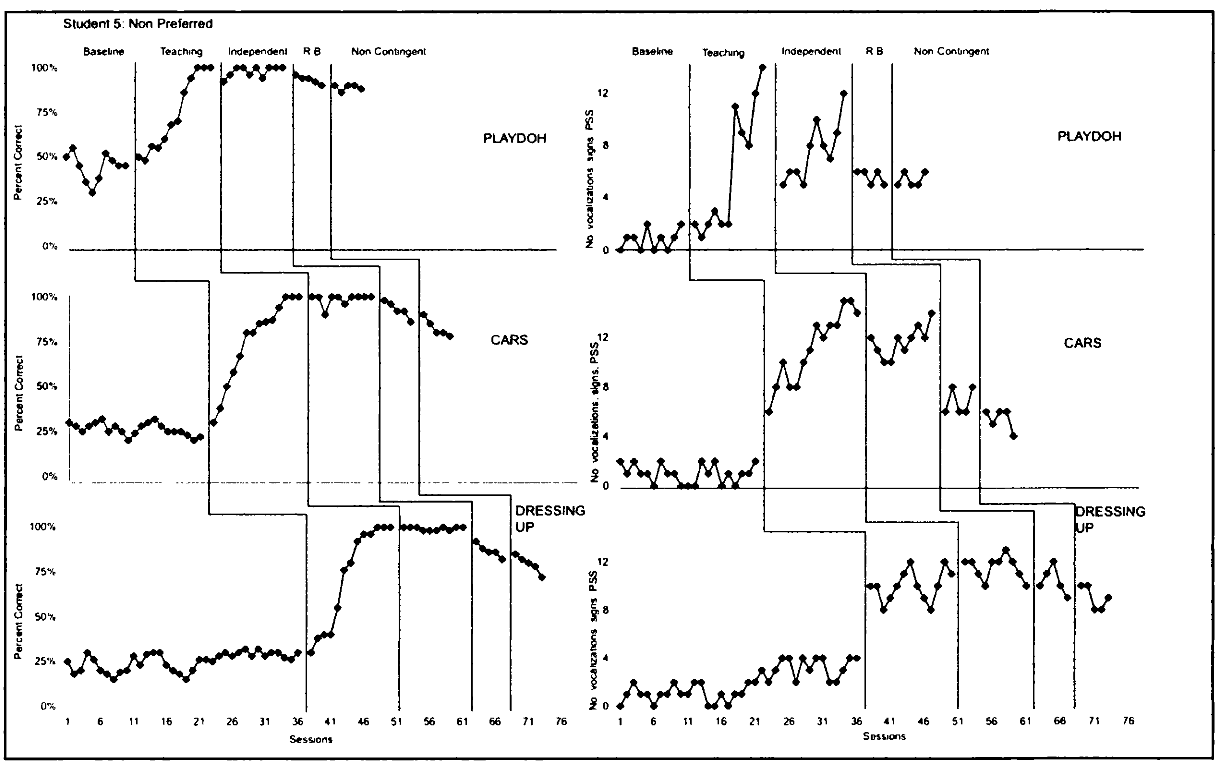


Figure 2.10: Student 5 Preferred play and vocalizations, signs or PSS.

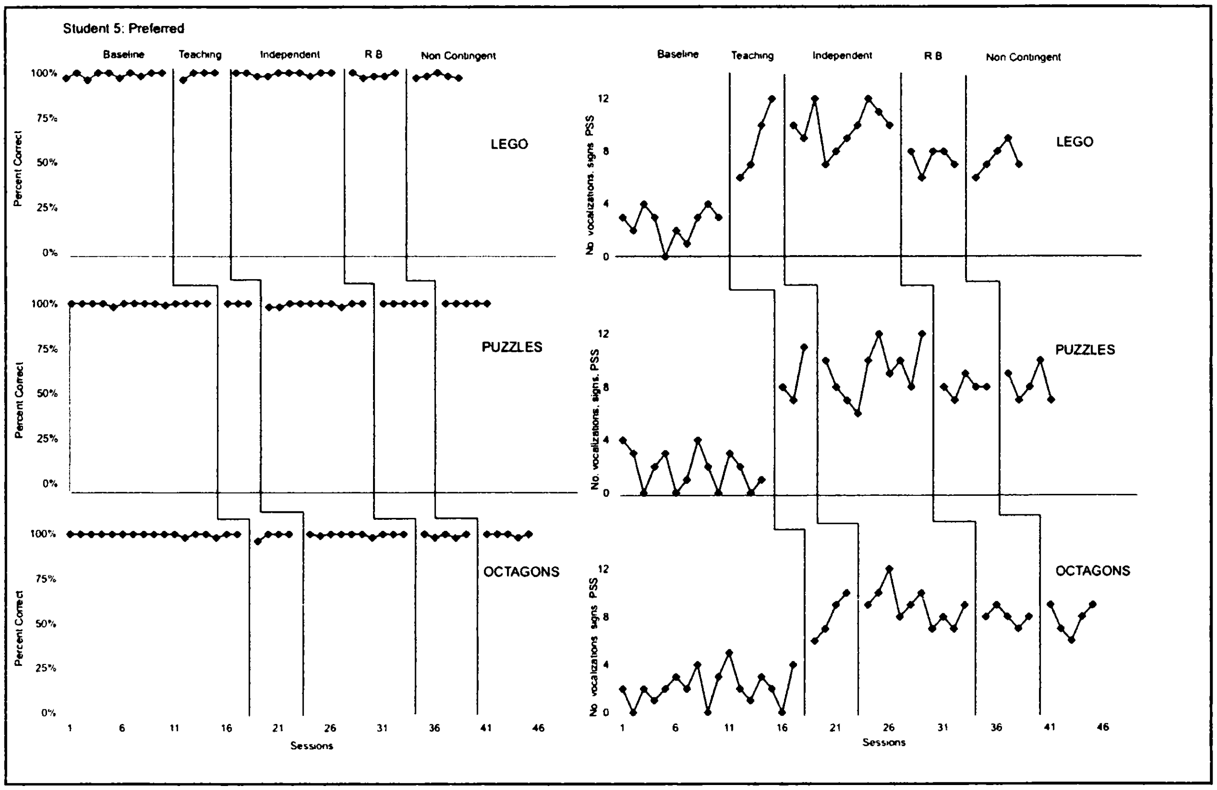


Figure 2.11: Student 6 Non-preferred play and vocalizations, signs or PSS.

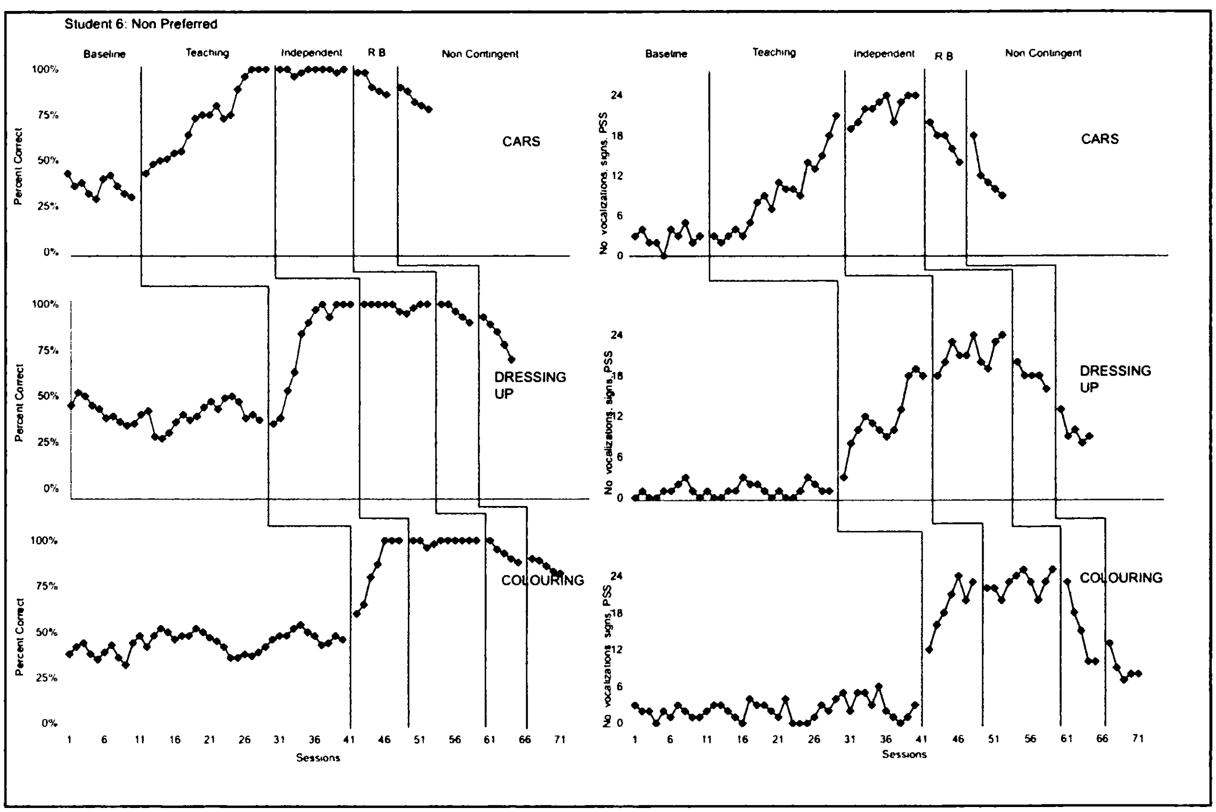


Figure 2.12: Student 6 Preferred play and vocalizations, signs or PSS.

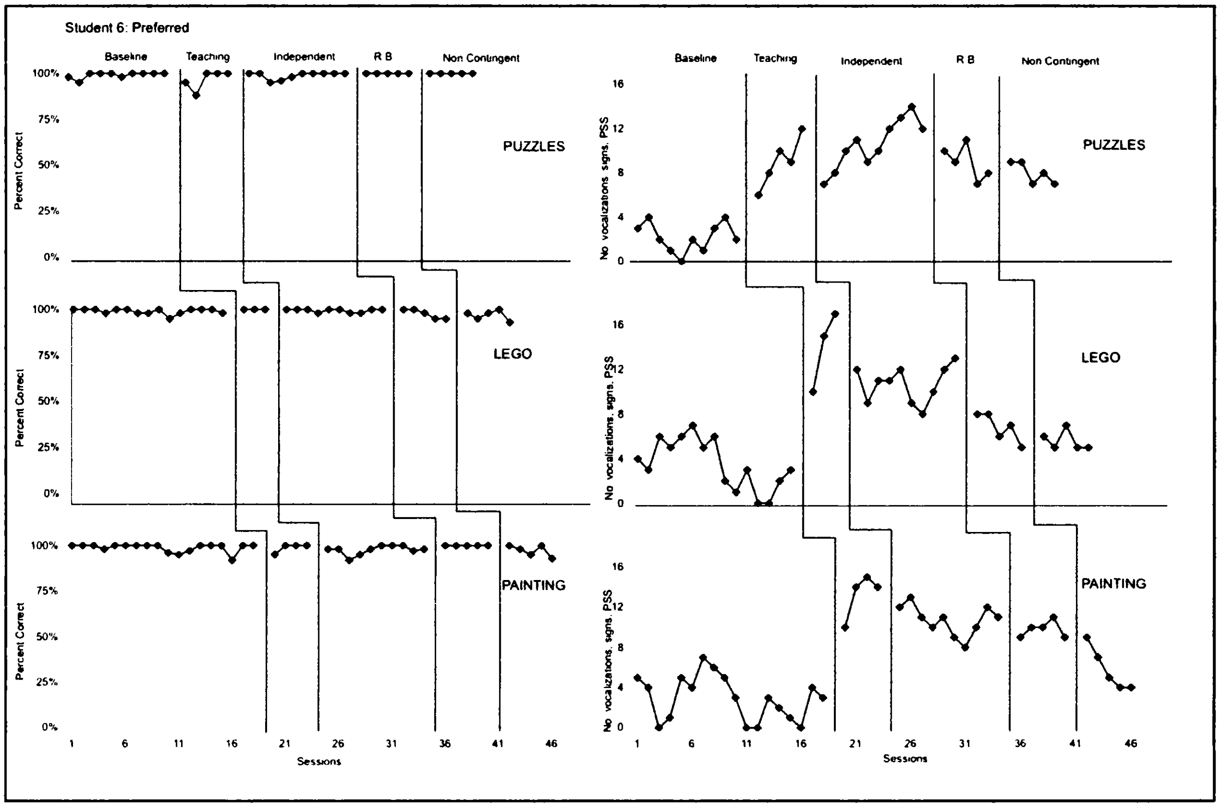


Figure 2.13: Student 7 Non-preferred play and vocalizations, signs or PSS.

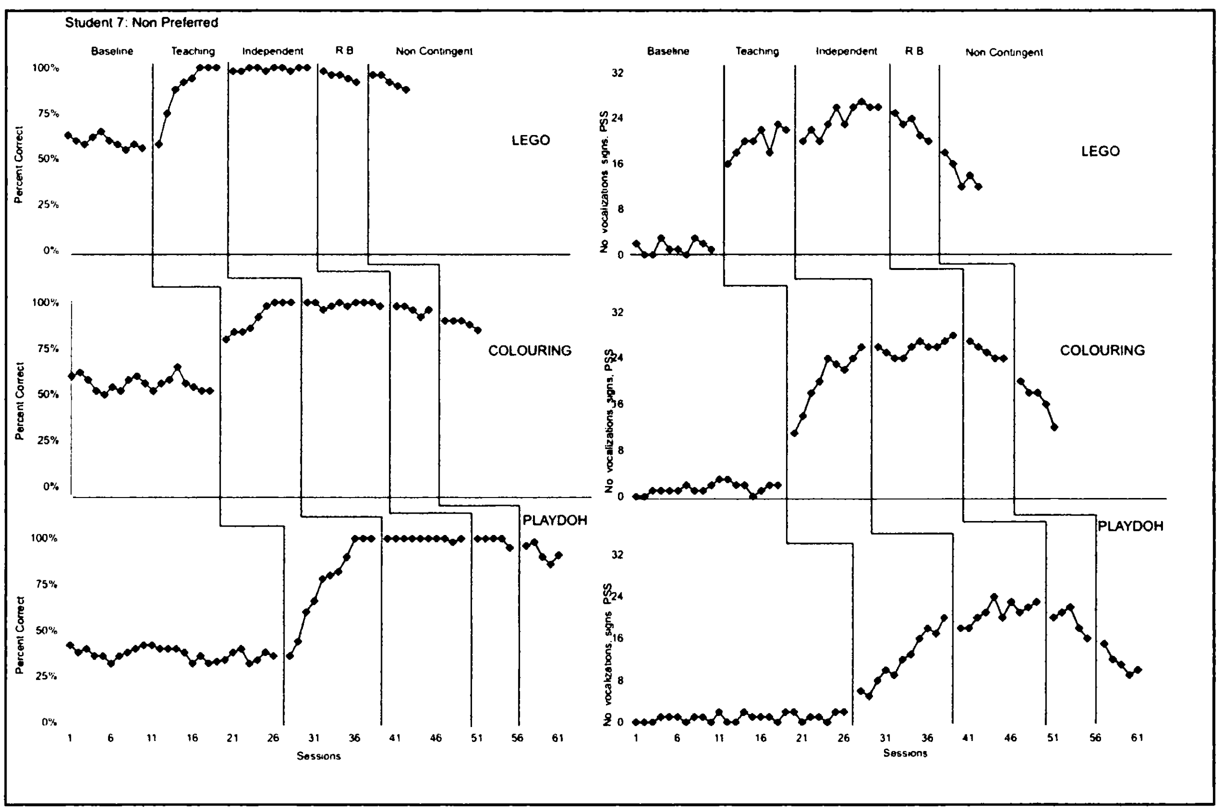


Figure 2.14: Student 7 Preferred play and vocalizations, signs or PSS.

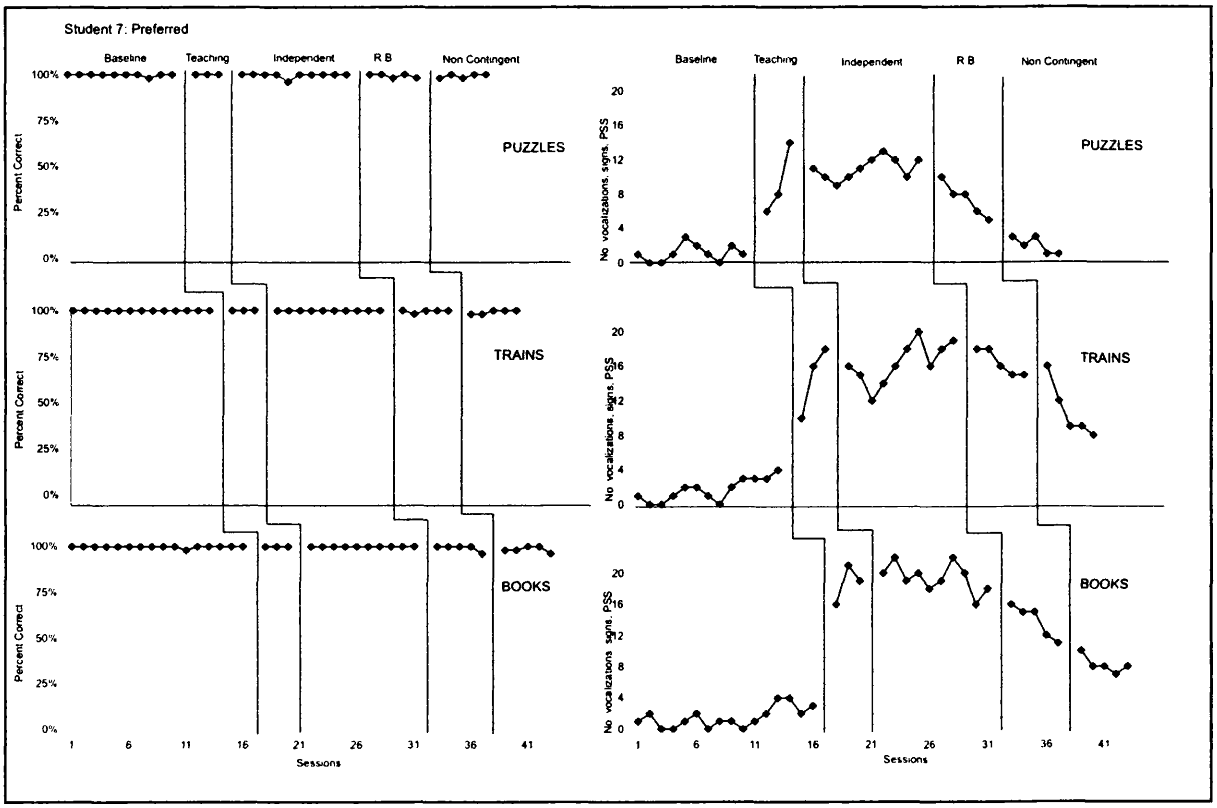


Figure 2.15: Student 8 Non-preferred play and vocalizations, signs or PSS.

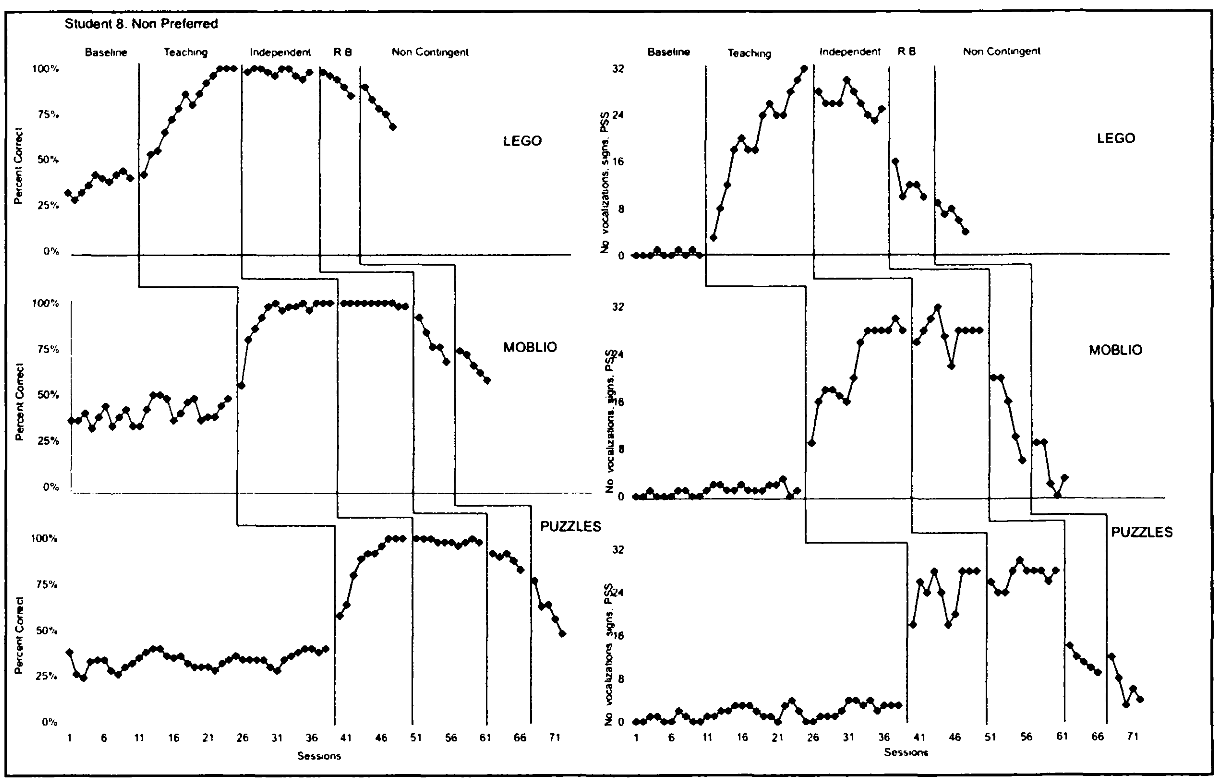


Figure 2.16: Student 8 Preferred play and vocalizations, signs or PSS.

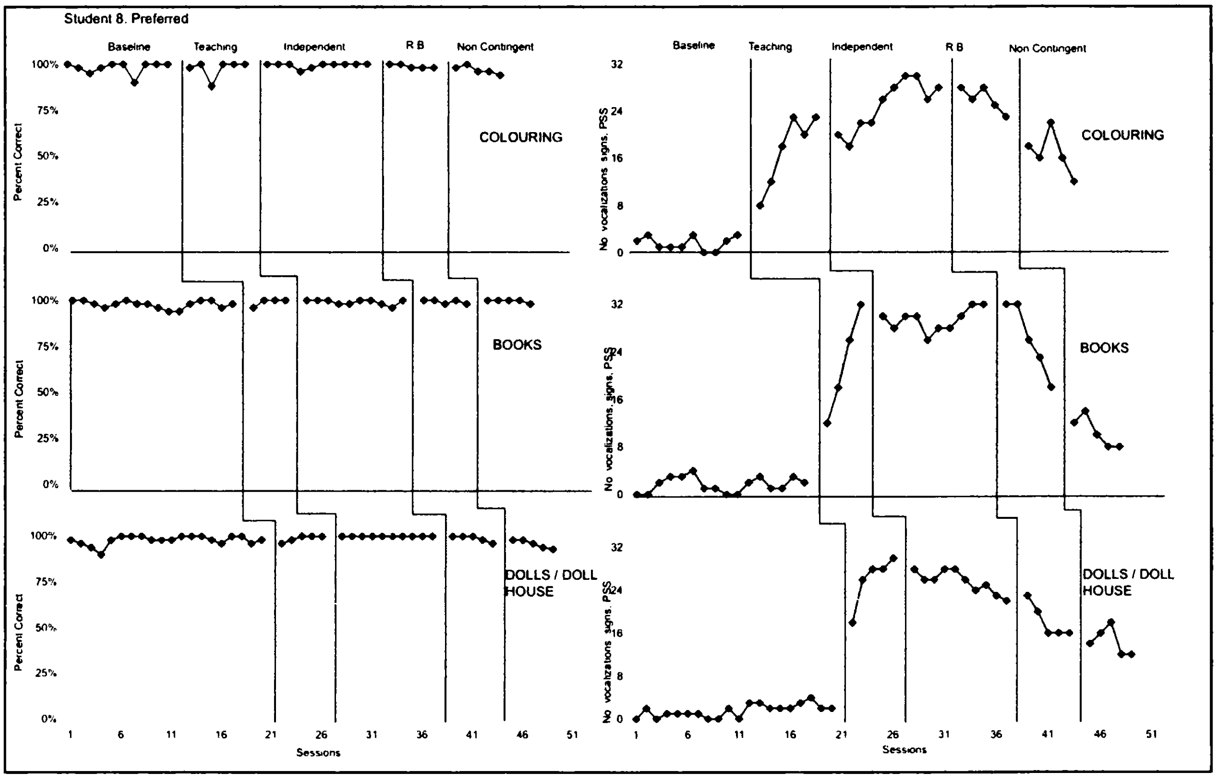


Figure 2.17: Student 9 Non-preferred play and vocalizations, signs or PSS.

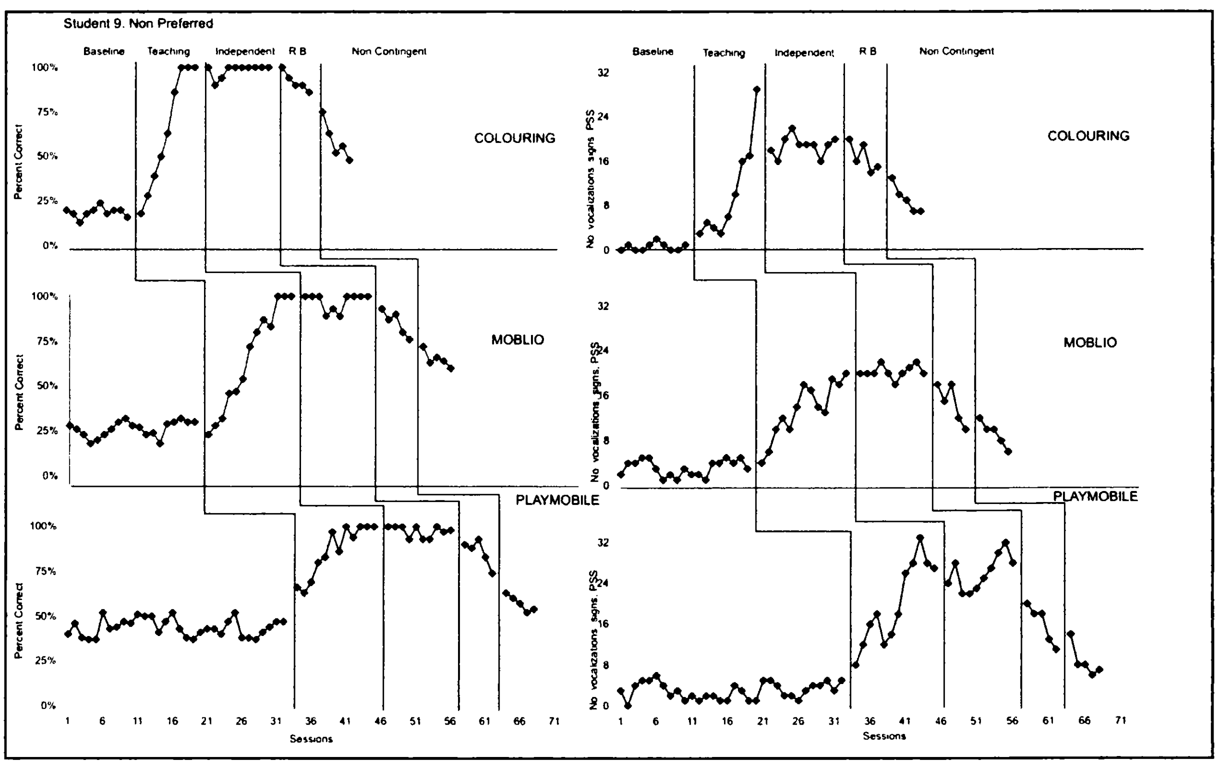


Figure 2.18: Student 9 Preferred play and vocalizations, signs or PSS.

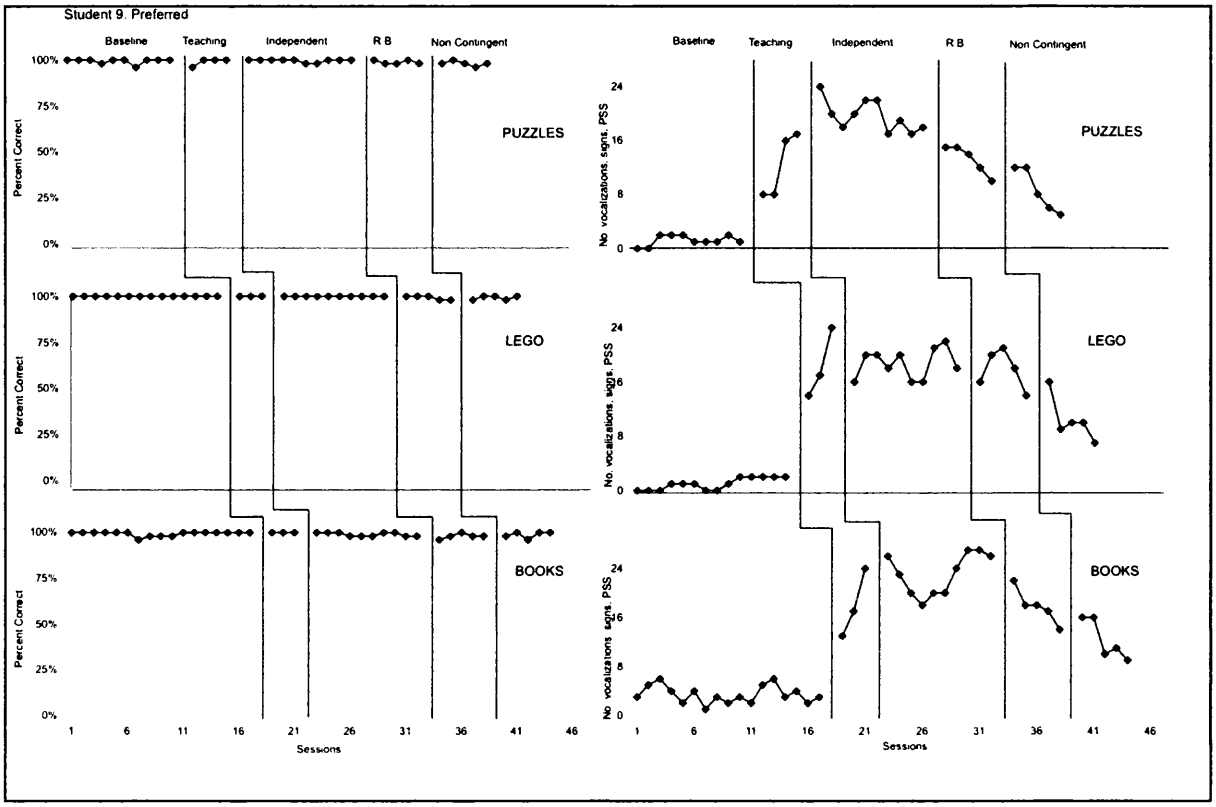


Figure 2.19: Student 10 Non-preferred play and vocalizations, signs or PSS.

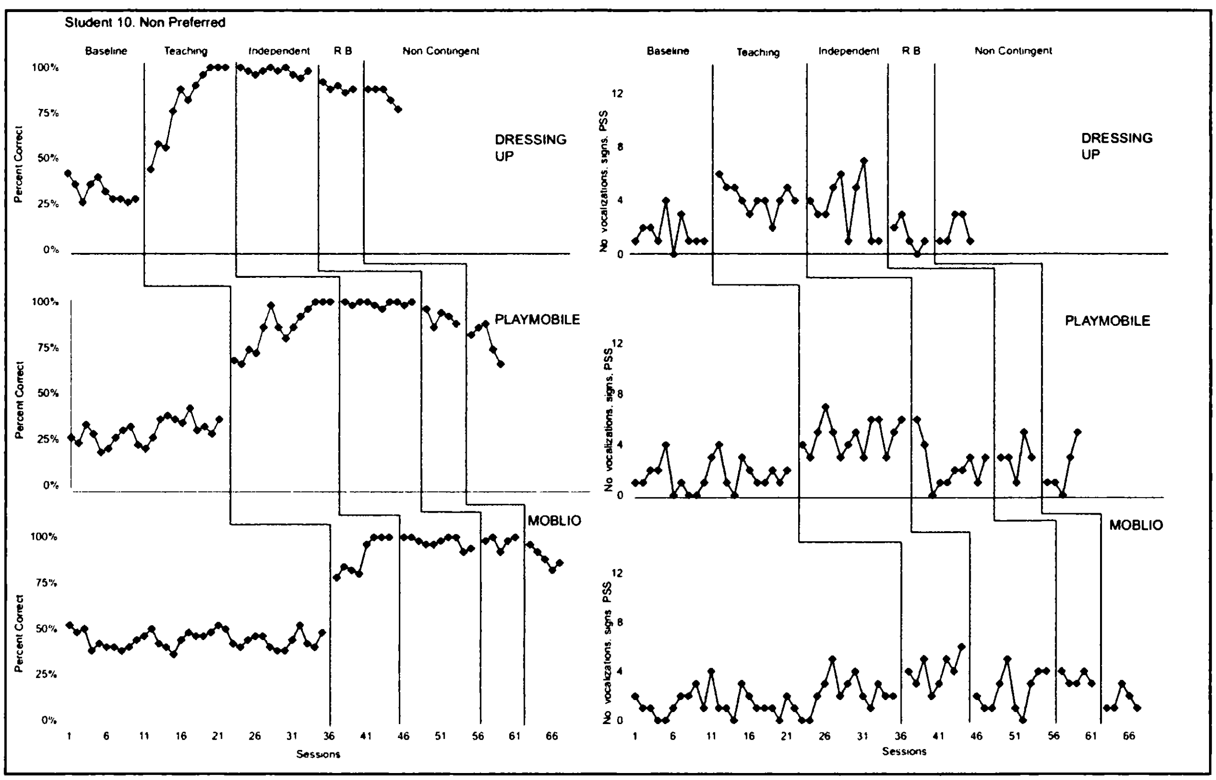
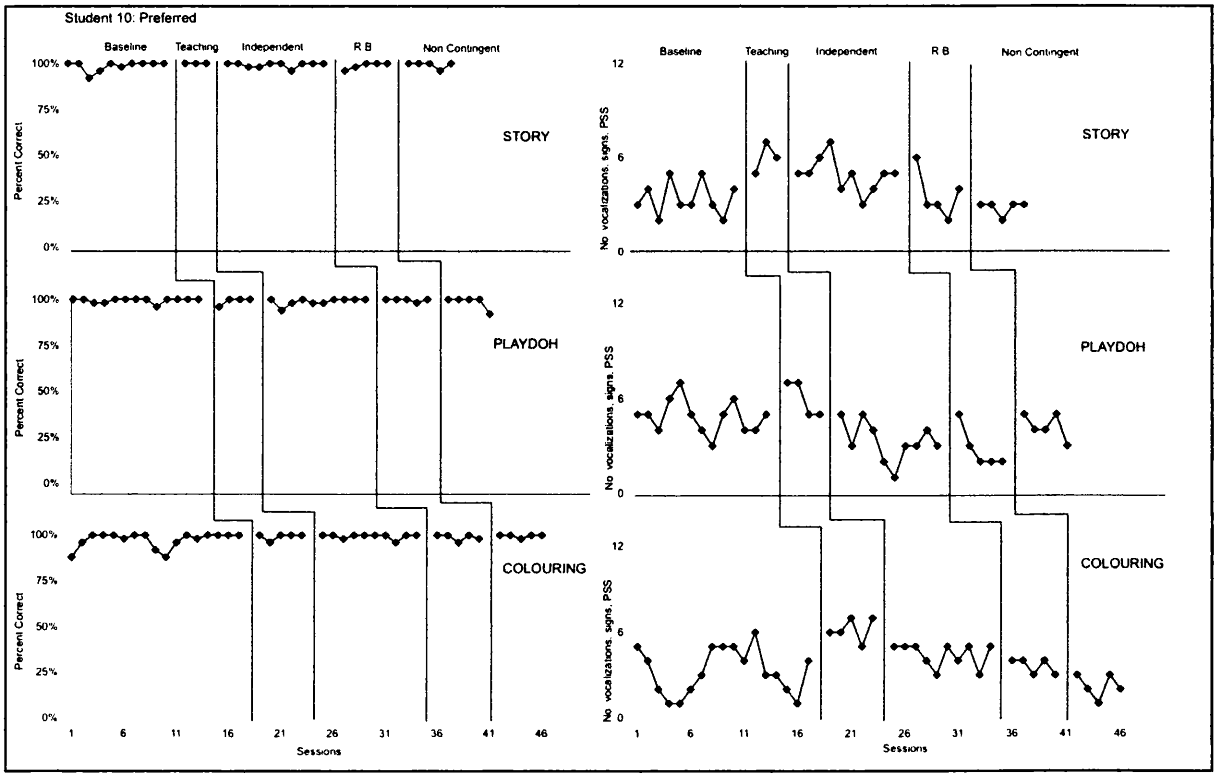


Figure 2.20: Student 10 Preferred play and vocalizations, signs or PSS.



The results presented in Figures 2.1 to 2.20 show both preferred, and non-preferred, play tasks (shown as a percent correct), including Baseline (A), Teaching (B), Independent Play (C), Return-to-Baseline (A) and a Non-contingent phase (D). The corresponding number of unique picture exchanges and signs, and/or vocalizations, that occurred during each ten-minute play period, for each participant, is also presented in the adjacent graphs. Overall, the results show that: (a) the introduction of the "Conversation Prompt" card designed to teach tacts for *private events* did help increase non-preferred play activities in children with ASD, (b) an increased number of generalized vocalizations, signs and picture exchanges, also resulted in both the preferred and non-preferred conditions, and (c) by teaching appropriate play, there was a natural reduction in aberrant (off-task) behaviour recorded.

The non-preferred play activities, which were targeted for teaching, showed the impact the introduction of the "conversation prompt" card had across participants. During the non-preferred phase, a range of between 13% and 90%, or between 8 to 54, 5s intervals of on-task behaviours being emitted, for each ten minutes play period, across subjects, with a *M*= 44.8% correct (approximately 28 intervals recorded +). This corresponds to the Teaching (*M*= 83.5%), and Independent (*M*= 97.9%), phases, during which the correct response achieved criteria, and was independently maintained for ten sessions. During the Return-to-Baseline (*M*= 91.9%) correct responding decreased, but remained within criteria, while during the Non-contingent phase (*M*= 80.9%) participants emitted fewer correct responses, although on average 48, 5s intervals per ten minute play sessions were still being positively emitted (see Appendix A for mean and range table for preferred and non-preferred responding across all ten participants).

As in the Preferred Play sessions, the impact of the "Conversation Prompt" card can be seen in the number on generalized vocalizations, signs and picture exchanges, across all students (see Table 2.5). During Baseline, a mean of 1.1 generalized tacts for each ten minutes session across subjects was recorded, with a noticeable increase being recorded during the Teaching phase (*M*= 11.2), and during the Independent phase (*M*= 14.2). This level of responding was maintained during the Return-to-Baseline (*M*=11.1), and although lower during the Non-contingent phase (*M*= 6.3), it was nevertheless six times what was recorded during the Baseline phase.

During the baseline conditions, a mean of 3.6 spontaneously emitted language interactions across subjects was recorded during preferred play, and a mean of 1.1 per ten-minute period. This increased to a mean of 13.7 (preferred play) and

14.2 (non-preferred play) during the independent play phase, which followed the intensive teaching phase.

Table 2.5: Mean number of unique vocalizations, signs or picture exchanges during preferred and non-preferred play across each phase for each student per session.

	Baseline	Teaching	Independent	Return	Non-contingent
Student 1					
Preferred	*M*= 7.06	*M*= 15.5	*M*= 18.0	*M*= 18.2	*M*= 8.1
Non-preferred	*M*= 0.63	*M*= 9.3	*M*= 10.9	*M*= 11.0	*M*= 8.2
Student 2					
Preferred	*M* = 5.5	*M* = 10.7	*M* = 11.4	*M* = 10.2	*M* = 6.3
Non-preferred	*M* = 0.98	*M* = 7.7	*M* = 13.3	*M* = 9.5	*M* = 6.7
Student 3					
Preferred	*M*= 8.1	*M*= 15.8	*M*= 19.1	*M*= 17.7	*M*= 7.9
Non-preferred	*M*= 0.6	*M*= 12.8	*M*= 10.4	*M*= 11.8	*M*= 8.2
Student 4					
Preferred	*M* = 0.7	*M* = 2.5	*M* = 1.9	*M* = 1.6	*M* = 1.5
Non-preferred	*M* = 0.34	*M* = 1.6	*M* = 1.9	*M* = 2.1	*M* = 1.1
Student 5					
Preferred	*M* = 2.1	*M* = 8.5	*M* = 9.3	*M* = 7.8	*M* = 7.8
Non-preferred	*M* = 1.2	*M* = 8.9	*M* = 10.3	*M* = 7.6	*M* = 6.6
Student 6					
Preferred	*M* = 2.9	*M* = 12.1	S*M* = 10.7	*M* = 8.5	*M* = 6.5
Non-preferred	*M*= 2.0	*M*= 13.4	*M*= 22.0	*M*= 16.8	*M*= 10.3
Student 7					
Preferred	*M* = 1.5	*M* = 14.2	*M* = 15.2	*M* = 13.7	*M* = 7.0
Non-preferred	*M* = 0.9	*M* = 15.7	*M* = 22.6	*M* = 22.4	*M* = 14.2
Student 8					
Preferred	*M* = 1.6	*M* = 15.1	*M* = 26.6	*M* = 23.5	*M* = 13.9
Non-preferred	*M* = 1.0	*M* = 22.1	*M* = 26.3	*M* = 12.5	*M* = 6.0
Student 9					
Preferred	*M* = 1.9	*M* = 16.2	*M* = 20.5	*M* = 16.3	*M* = 10.5
Non-preferred	*M* = 1.2	*M* = 15.0	*M* = 21.7	*M* = 15.1	*M* = 1.0
Student 10					
Preferred	*M* = 3.8	*M* = 6.1	*M* = 4.2	*M* = 3.3	*M* = 3.1
Non-preferred	*M* = 1.6	*M* = 5.4	*M* = 2.8	*M* = 2.6	*M* = 1.8

2.4 Discussion

This study set out to teach a set of tacts for "*private events*", which would function as conditioned reinforcers to teach children with ASD non-preferred play activities. A reduction in inappropriate behaviour, including inappropriate play and manipulation of the play materials, would result from an increase in spontaneous language and conditioned appropriate play.

The findings of this study suggest that having access to typical language interactions, and a set of "tacts for *private events*", could, under certain conditions, function as a conditioned reinforcer when teaching non-preferred activities. The play data for all ten children show that the introduction of the "conversation prompt procedure" resulted in mastery of the previously non-preferred play activities, which were learned to criterion, and maintained in both the return-to-baseline, and non-contingent, phases. It also appears to have had a positive effect on spontaneously emitted language (usually in the form of pure mands and tacts), which was functionally related to teaching the children in this study to tact their "*private event*" during and after prescribed play sessions. This data suggests that unique vocalizations, signs or picture exchanges can be a relational outcome of intensive tact training, as applied here to teaching "tacts for *private events*".

Due to the intrinsic deficits in language and social behaviour in children with ASD, a great deal of the current research into the disorder has been focused on improving communication skills, while reducing escape, and attention seeking, behaviours (Scattone, et. al., 2002). The findings of this research seem to support this, and fit in easily with the argument being put forth by Functional Communication Training, that new forms of verbal behaviour are a type of differential reinforcement of alternative behaviour (Kurtz, Chin, Huete, Tarbox, O'Conner, Paclawskji & Rush 2003). Equally, these findings further support the research into using picture systems and activity schedules to prompt independent play and social interaction between children (McClannahan & Krantz, 2005). Finally, and perhaps most importantly, these findings suggest that teaching *private* *events* in the context of the "conversational unit" offers children with ASD an increased opportunity to be reinforced by their "words" (Donley & Greer, 1993; Lodi & Greer, 1989).

The study and recognition of the importance of tacting *private events* has been sparsely addressed by the literature in behaviour analysis, although it remains a mainstay of traditional Speech and Language Therapy since the "pragmatic revolution" (Bloom & Lahey, 1978; Dore, 1974, 1975; Halliday, 1975), when the shift from defining language in terms of syntax, phonology, and content, to use, was first suggested. In addition, interest in the emotional development of the individual has been poorly represented in behaviour-analytic research (Friman, Hayes & Wilson, 1998a; 1998b). This may be due, in part, to the lack of precision in both the terminology that describes various states of emotion, and to the perceived inability to reliably measure the less-than-concrete-boundaries of the tacts for *private events*. The result is that practitioners must ask themselves how do we really know whether a child's use of the word "*happy*", or "*sad*", can have the same measurable validity as when they point (or direct their gaze toward) to a chair or table, and say "*chair*" or "*table*". Yet, the importance of these tacts for *private events* cannot be discounted because our fidelity to the science of behaviour analysis requires definitive and observable behaviours, with clearly defined parameters. Instead, the parameters need to be broadened and applied to the study of emotion and the language of emotion (tacts for *private events*).

Much additional work needs to be done to understand the complex role that tacts for *private events* play in the emerging language and social development of children with ASD. Additional study needs to be undertaken to address the validity of these findings to generalized situations, and to the shifting and often ambiguous context of 'talking about" our emotions. The present results should be interpreted in the context in which there were measured, and not as an indication that the tacts for "*private events*" under investigation are a generative form of verbal behaviour. Although there were clearly ascending trends across all phases of instruction, and the corresponding spontaneous language measures, it is important to remember that the environment in which these measures were taken were highly contingent and controlled ABA Home Programme sessions. One area of future research would be to transferring the "conversational prompt" procedure to naturalistic, and unscripted settings across the subjects day.

3 TEACHING CHILDREN WITH ASD TO INITIATE A CONVERSATION: TALKING ABOUT EMOTIONS

3.1 Introduction

Children with Autistic Spectrum Disorders (ASD) are commonly thought to experience deficits in the perception and understanding of emotional and cognitive states (Attwood, Frith & Hermelin, 1988; Langdell, 1981; MacDonald, Rutter, Howlin, Rios, LeCouteur, Evered & Folstein, 1989; Yimiya, Kasari, Sigman, & Mundy, 1989). Such children have also been shown to struggle socially when they are required to respond to questions and comments, while they often contribute fewer narratives of personal experience than typically developing children (Capps, Kehres & Sigman, 1999; Yirmiya et. al., 1989). Although children with ASD have been found to be comparable to those children with Down syndrome in their talk about 'desire', 'perception', and 'emotion', they use significantly less language to describe these emotional and cognitive states than children with Down syndrome (e.g., Tager-Flusberg, 1992).

However, a growing body of evidence suggests that children with ASD may, in fact, possess insight into emotion, especially when it is not linked with belief (Baron-Cohen, 1991). Rather than lacking such insight, they often lack the necessary language to talk about how they experience the world (Tager-Flusberg, 1992). This suggests that children with ASD are less emotionally 'detached' than originally suggested, and are, instead, impaired by a lack of appropriate language through which to talk about emotional and cognitive states (Sigman, Kasari, Kwon & Yirmiya, 1992). Such a view implies that children with ASD should not be defined in terms of a 'poverty of emotional understanding' (e.g., Frith, 1991), but should instead be characterized as expressing emotion unconventionally, due to language deficits (e.g., Sigman, et. al., 1992).

Developing emotional competence is thought to be vital to participating in the social world, requiring a broad understanding of the emotions of ones-self and of others (Denham & Burton, 2003). Improved emotional literacy has also been shown to lead to a reduction of aberrant and disruptive behaviours, and to better mental and physical health (Denham & Holt, 1993; Parker & Asher, 1987; Robins & Rutter, 1990). Despite such findings, emotional competency is often overlooked in behaviour analysis, and, in particular, in the development of curricula for children with ASD (Knitzer, 1993). Due to there being a limited number of studies conducted on this topic in the behaviour analytic literature, there are few techniques available to help children with ASD develop such emotional competency, or improved emotional literacy.

However, behaviour analysis does offer a number of well-established techniques to help children with ASD develop conversation skills, prompt language, and increase their spontaneous responses, which are all considered to be prerequisites to improved emotional literacy. These procedures include script-fading, which has been shown to enable children with ASD to initiate conversations (Krantz & McClannahan, 1993, 1998; McClannhan & Krantz, 2005), to talk about things that happened in the past (Krantz, et. al., 1981), and to be an effective procedure for teaching children to talk about stimuli (Sarokoff, Taylor, & Poulson, 2001). Activity schedules have also been shown to effectively 'remind' children with ASD to initiate a conversation, without requiring the addition of verbal prompts, which can sometimes create a "prompt dependence" in children with delayed social language (McClannahan & Krantz, 1997). Teaching spontaneous language skills to children with ASD, such as: manding using a time-delay procedure (Charlop, Screibman, & Thibodeau, 1985), greeting skills and "thank you" (Charlop & Trasowech, 1991;

Matson, Sevin, Box & Francis, 1993), and the expression of emotion, such as: "I love you", (Charlop & Walsh, 1986), has provided verbal behaviour curricula with a well-regarded arsenal of procedures (Sundberg & Partington, 1998).

The present study employed the techniques described above, that have been shown to improve language comprehension, in order to attempt to promote a set of tacts for *private events* for children with ASD. The current research also built upon an earlier study in which tacts for *private events* were shown to function as conditioned reinforcers when teaching non-preferred play activities to children with ASD (see Chapter 2). In that study, tacts for *private events* (*fun*, *bored*, *don't like*, and *like*) were modeled during play, while providing the children with an opportunity to tact a response to how they were 'experiencing' both preferred and non-preferred play activities. The current study arranged opportunities for children with ASD to use the language of *private events* (target responses included: *fun*, *bored*, *like*, and *don't like*) to initiate a conversational unit regarding their private experiences after a period of play, and then assessed whether these conversations would generalize to allow comment on the private experiences from non-trained activities. It was hoped that this process, consequently, would foster increased understanding of emotional states.

3.2 Method

3.2.1 Participants

Ten children (8 male and 2 female), between the ages of 5.6 and 9.1 (mean age = 6.7 years) participated in this study. All of the children had been diagnosed by an independent Pediatrician with childhood autism, and had GARS (Gilliam Autism Rating Scale) quotients of between 68 and 111 (see Table 3.1).

Table 3.1: Descriptive statistics of selected variables for participants, including age, GARS scores & speaker skills.

Participant	Autistic Quotient	Percentile Rank	Probability/Severity	Speaker Skills
Student 1 - M (5.6 yrs)	70	2%	Below Average	PECS
Student 2 - M (5.8 yrs)	85	16%	Below Average	Vocal Verbal
Student 3 - M (6.5 yrs)	100	50%	Average	PECS
Student 4 - M (6.0yrs)	68	1%	Very Low	PECS
Student 5 - M (7.5 yrs)	80	9%	Below Average	Vocal Verbal
Student 6 - F (5.6 yrs)	93	32%	Average	Vocal Verbal
Student 7 - M (5.6 yrs)	111	77%	Above Average	Vocal Verbal
Student 8 - M (8.9 yrs)	110	75%	Above Average	Vocal Verbal
Student 9 - M (6.7 yrs)	85	16%	Below Average	Vocal Verbal
Student 10 - F (9.1 yrs)	110	75%	Above Average	Makaton

All the participants were receiving home-based ABA instruction (designed as a component programme of the CABAS® systems approach to education; Greer, 2002), which also included part-time placements in mainstream and special education schools. Students 1, 2, and 3 were in full-time special schools; Students 4, 5, 6, 7, and 8 were in school for a three-hour morning session; and Students 9 and 10 and attended a two-hour afternoon session. All of the children communicated through an augmented use of a picture symbol system, and had some Makaton Signs (manual sign), in their repertoires. Six of the children (Students 2, 5, 6, 7, 8, and 9) used limited vocal verbal behaviour to mand and tact, two had emerging vocal repertoires (Students 1 and 3), while two (Students 4 and 10) did not consistently use vocal verbal behaviour to communicate, and had only a limited range of sounds and motor functions.

Spontaneous initiations for all of the children were limited to a set of single word mands (e.g., "*drink*" or "*biscuit*", and included signs for "*more*" and "*finished*"). In addition, the children would point, and pull adults, to desired items or activities. None of the children would initiate an interaction with another child without prompting, and typically ignored the attempts of classmates and peers to engage them in even the simplest forms of interaction (e.g., eye contact). Multiple word phrases were infrequent, and were limited to "*I want*" and "*I want please*", although teachers, or parents, often prompted these responses.

Prior to the current study, all of the children had been taught, through modeling and reinforcement (see Chapter 2), to successfully use one-word comments (e.g., "*puzzles fun*", "*lego boring*") after completing preferred and non-preferred play activities. None of the children had tacted other age-appropriate *private events* (e.g., "*I'm tired*", or "*I'm happy*"). Pure tacts were limited to a list of identifications in response to the presentation of pictures, or objects, and as responses to the questions, such as: "*What is it?*" or "*What do you see?*". These behaviours were rarely generalized, or performed independently.

3.2.2 Setting and Materials

The research was conducted in each of the participants' homes, and was designed to be fully integrated into their home-based ABA programmes. Typically, each room where the training was conducted contained a work table, and a set of chairs, programme materials, and a book case, on which toys and reinforcers were clearly displayed in transparent bins, labeled with picture symbols identifying what materials were contained in each box. A schedule board was clearly displayed in each of the session rooms (PECS Schedule Board), and a set of colour symbol cards

(2 inch by 2 inch), for each of the play activities with a Velcro® back, were arranged in a schedule book (picture symbols cards were made using Meyer-Johnson Board Maker). The conversation prompt "talk" cards were included on the visual schedule, placed between each activity card, during baseline and teaching phases, with pre-selected conversation response cards included in the PECS book. These cards included two symbols representing tacts for *private events* (either "*fun*" and "*boring*", or "*like*" and "*don't like*"), and the symbols for "*yes*" and "*no*". The conversation prompt cards were designed to prompt the child to initiate a conversational unit.

3.2.3 Behaviour Definitions (Dependent Variables)

3.2.3.1 Initiating a conversation

In the teaching phase (B), correct responses were defined a retrieving the appropriate conversation picture card (a picture symbol of a tact for a *private events*), and exchanging it to initiate a conversational unit through an exchange. To be correct, the participant needed to select either: *fun*, *bored*, *liked* or *don't like*, from the main PECS book. An incorrect response was defined as the child not offering a picture symbol for exchange, or selecting a picture symbol that was either not one of the *private events*, or another pure tact or mand that was not related to the activity previously completed.

3.2.3.2 The Conversational Unit

The conversational unit during the teaching phase (B) was defined as a speaker-listener-speaker interaction, which included at least one of the pre-selected tacts for *private events* (*fun*, *boring*, *liked*, or *don't like*), and a set of four unrelated, randomly selected symbols. Each unit was defined as a child placing one of the picture symbols onto a sentence strip, and exchanging it with a language partner (the teacher). Each exchange was paired with an appropriate sign, or vocalization for verbal children, during all phases of training. This speaker-listener-speaker unit was followed by the instructor 'listening' to the child's initiation, and responding in turn.

A typical conversation might be as follows: the child organizes a sentence strip which reads: "*colouring liked*", after completing a colouring task, to which the teacher listens, and responds: "*you've coloured a tree!*" (speaker-listener-speaker). This conversation is then followed by the teacher confirming the child's response by asking the child: "*Did you like colouring?*", to which the child answers, either: "*yes,* (e.g. *liked colouring*), or "*no*" (e.g. *don't like colouring*).

3.2.3.3 Generalization Probes

Following the return-to-baseline phase, a generalization probe was conducted to determine whether the children would respond to a 'talk' prompt across non-play scheduled activities, including after school, after programme work, after meals/ snacks, after video, after music, after outdoor time. With the 'talk' prompt in the PECS book, children were offered the opportunity to initiate a conversation by selecting the "talk" symbol, and selecting an appropriate symbol card for exchange. Initiations were scored correct if they included a tact for a *private events* and the activity symbol (e.g., "*school fun*") that was deemed appropriate for each opportunity. A total of ten opportunities for each generalization probe were counted.

3.2.4 Experimental Design and Measurement

A multiple-baseline with full reversal (ABAD), followed by a generalization probe, to assess the effectiveness of the procedure across novel settings, was used in this study. Data sheets were separated into two mand columns, one each for correct initiations, and incorrect initiations (Teaching 1). A third column of correct and incorrect responses for was used to record the confirmation (yes/no) response. All measures were recorded as individual events. Each conversational unit (speaker-listener-listener as speaker) was considered a Learn Unit (see Greer, 2002), defined as a three-term interlocking contingency between child and teacher, which included an antecedent, a behaviour, and a response for both the child and teacher.

3.2.5 Baseline (Responding to a "talk" prompt)

During baseline, a measure of the participant's ability to initiate a conversational unit, in response to a 'talk' prompt card placed on the visual schedule, was taken. The 'talk' symbol was introduced in order to prompt the child to initiate a conversational unit, by exchanging the 'talk' card with their language partner (the teacher), which was scored as a mand for talking. Once the 'talk' card was exchanged, the child was then expected to select a symbol for either: *fun*, *boring*, *liked*, or *disliked*, to exchange as an initiation of the conversational unit. The conversational unit was defined as the exchange of picture symbol, and the appropriate vocalization for vocal verbal children, between the child and language partner. Each correctly and incorrectly scored initiation was recorded as a plus or minus in the appropriate column on the data sheet.

A teacher, with a minimum of one year's experience teaching in an ABA home programme, conducted all of the sessions. A senior ABA Behaviour Analyst supervised all training, and teaching sessions. Sessions were conducted between three times per day, for a period of 40 min each, five days per week.

During baseline, the child was also requested to organize their activity schedules for their play sessions. The schedule included 'talk' prompts between each scheduled play activity.

3.2.6 Teaching (initiating a conversation)

During the teaching phase, the baseline conditions were maintained, with the addition of a full physical/echoic prompt to shape the appropriate response to the 'talk' card and the conversational unit. In this phase, the language partner physically prompted the child to exchange the 'talk' prompt, followed by the presentation of the *private events* choices. These were modeled with a full echoic prompt, which was then faded after five consecutive session of 100% correct responding.

In this phase, the presentation of the 'talk' card to the language partner was scored as a mand to talk. The language partner was then able to direct the child to the choices for each activity, and the *private events*, *fun*, *boring*, *liked*, or *disliked.* The child was then able to select from the four choices, which was then modeled as a full echoic prompt by the language partner. This was scored correct if the child echoed the response, and was scored as incorrect if no response or a different response was offered. This was followed by a confirmation opportunity during which the child was asked if the activity was either: *fun*, *boring*, *easy*, or *hard*, with a *yes* or *no* response. This data was collected to assess the internal validity of the child's response.

3.2.7 Return-to-Baseline

During the return-to-baseline phase, the 'talk' prompt remained on the schedule board, between each play activity, and the choice board for *private events* responses remained available. Subjects were required to retrieve and exchange the 'talk' card independently, and to initiate the conversational unit with one of the "*private event*" cards. Each step require and exchange and a vocalized response where appropriate.

3.2.8 Generalization Probe

During the generalization probe the baseline conditions were maintained during unique opportunities across the subject's day. Conversation opportunities included after school, after programme work, after snack or meals, after video, after music and after outdoor play. Generalization probes were completed in a mixed order for all the participants, and coincided with natural opportunities in each child's schedule. During these opportunities, the subject was presented with the 'talk' card, to prompt the conversational unit, after which the subject could select an appropriate response, in the form of *fun*, *boring*, *liked*, or *disliked*. The conversational unit was defined as the exchange of symbols (accompanied by a vocalization) where appropriate.

3.2.9 Inter-observer Agreement

Inter-observer agreement was calculated using Cohen's Kappa to control for chance agreements, calculated across 100% of the sessions for each of the children. This score had a range across participants of between 0.58 and 1.0. The Cohen's Kappa for the Baseline (A) had a mean across the participants of 0.76, and ranged from 0.58 to 1.0; for Teaching (B), the mean was 0.91, and the range was 0.60 to 0.98; for the Return-to-Baseline (B), the mean was 0.88, and the range was between 0.58 and 1.0 (see Table 3.2).

Table 3.2: Inter-observer agreement across baseline, teaching and return-to-baseline phases, reported as Cohen Kappa.

Inter-observer Agreement: Study Phases			
	Baseline (A)	Teaching (B)	Return/BL (A)
Student 1	1.0	0.91	0.60
Student 2	0.60	0.96	1.0
Student 3	0.58	0.95	0.79
Student 4	0.68	0.95	1.0
Student 5	0.55	0.95	0.78
Student 6	0.95	0.89	1.0
Student 7	1.0	0.60	0.92
Student 8	0.66	0.94	0.85
Student 9	1.0	0.98	1.0
Student 10	0.58	0.97	0.88

Agreement for the "Generalization Probes" across subjects during the *After School* probe had a mean of 0.96, and ranged between 0.88 and 1.0; the *After-Programme Work* probe had a mean of 0.87, and ranged from 0.60 to 1.0; for *After Meal/Snack*, the mean was 0.96, and the range was between 0.88 to 1.0; for *After Video*, the mean was 0.91, and the scores ranged between 0.58 and 1.0; for After Music, the mean was 0.92, and the range was between 0.55 and 1.0; and for the *After Outdoor Play* probe, the mean was 0.85, and they ranged from 0.58 to 1.0. Thus, agreement was reasonably high for all participants in all phases of the study (see Table 3.3).

Table 3.3: Inter-observer agreement across the generalization probes, reported as Cohen Kappa.

Inter-observer Agreement: Generalization Probes						
	Post - School	Post - Work	Post – Meals	Post - Video	Post - Music	Post Outdoor Play
Student 1	1.0	0.78	0.95	0.89	0.94	0.79
Student 2	1.0	0.98	1.0	0.96	0.95	1.0
Student 3	0.98	1.0	0.90	0.58	0.98	0.58
Student 4	0.95	0.68	1.0	0.91	0.91	0.79
Student 5	0.91	0.95	0.98	1.0	0.55	1.0
Student 6	1.0	1.0	0.88	0.89	1.0	1.0
Student 7	0.90	1.0	1.0	1.0	1.0	0.85
Student 8	0.88	0.89	1.0	1.0	0.94	1.0
Student 9	1.0	0.60	0.92	0.97	0.92	0.60
Student 10	1.0	0.79	0.95	0.91	1.0	0.87

3.3 Results

The results presented in Figures 3.1 to 3.5 show the responses of Students 1 to 10 in the Baseline (A), Teaching (B), Return-to-Baseline (A) and generalization probes across novel situations (D). Overall, the results show that: (a) the introduction of the 'talk' card, designed to prompt the conversational unit, was an effective means to teach the participants to engage in a conversation with their 'language partner', (b) conversations based on *private events* could be initiated by children with ASD, and (c) that these conversations could then be generalized to novel situations.

During the Baseline, a range of 0-2 correct responses were emitted, across the ten participants, in response to the untrained 'talk' card being presented between the structured ten minute play tasks. During this phase, a mean of 0.3 correct responses across participants were recorded per session, suggesting that the participants were not able to independently respond to a prompt to 'talk' about the activity that they completed immediately prior to the presentation of the 'talk' card.

During the teaching phase, a range of 0 to 10 correct responses were emitted across the ten subjects (out of ten possible opportunities), as the subjects learned to respond to the "talk" prompt, which was presented following each play activity. A mean of 7.5 correct responses across subjects per session was recorded. Correct responses increased across the teaching phase (B) from a mean of 2.6 correct during the first session, to a mean of 10 correct by the end of the teaching phase (see Appendix B for mean and range scores across participants and phases).

Figure 3.1: Conversations and correct and incorrect across baseline, teaching and return-to-baseline for students 1 and 2.

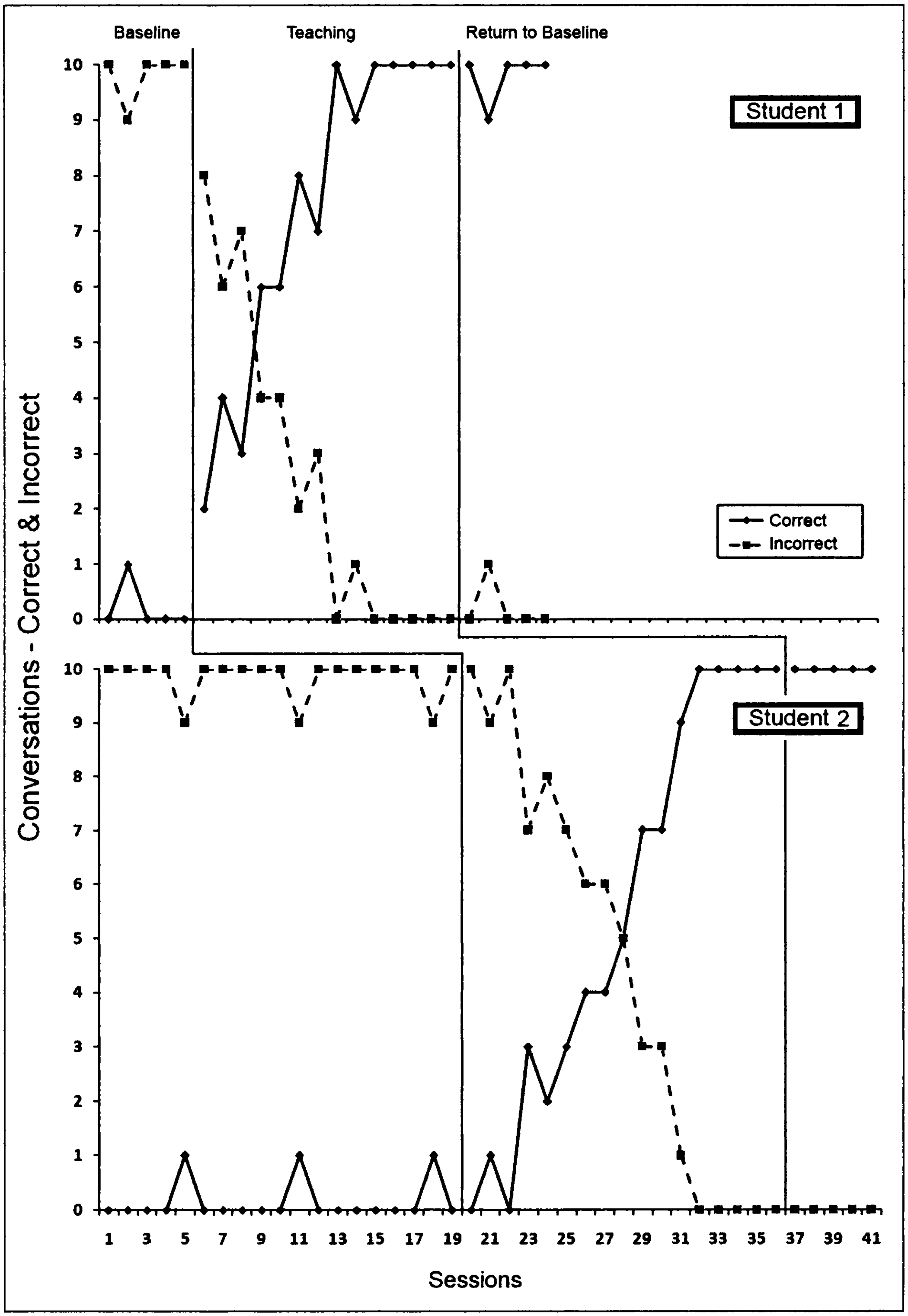


Figure 3.2: Conversations and correct and incorrect across baseline, teaching and return-to-baseline for students 3 and 4.

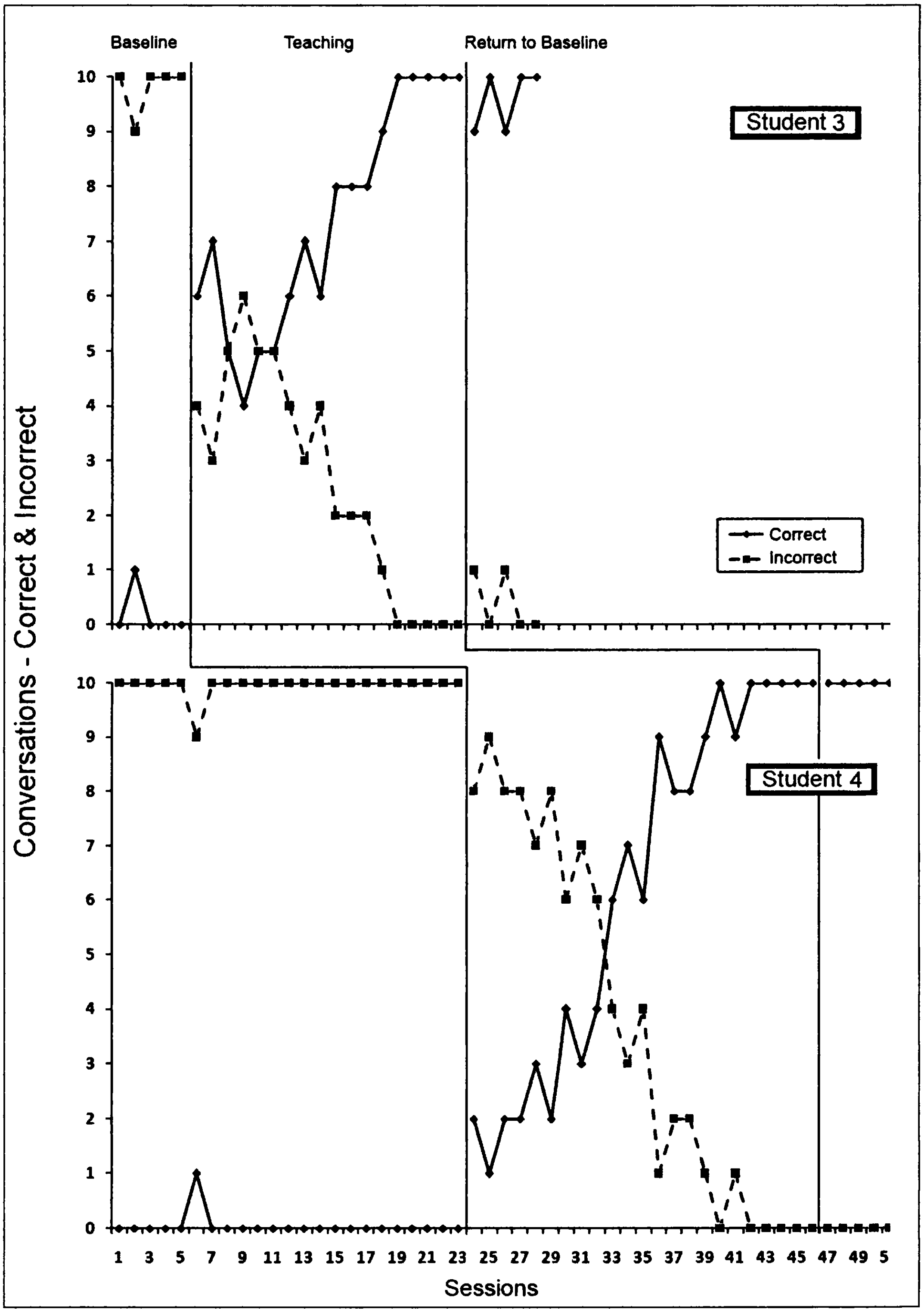


Figure 3.3: Conversations and correct and incorrect across baseline, teaching and return-to-baseline for students 5 and 6.

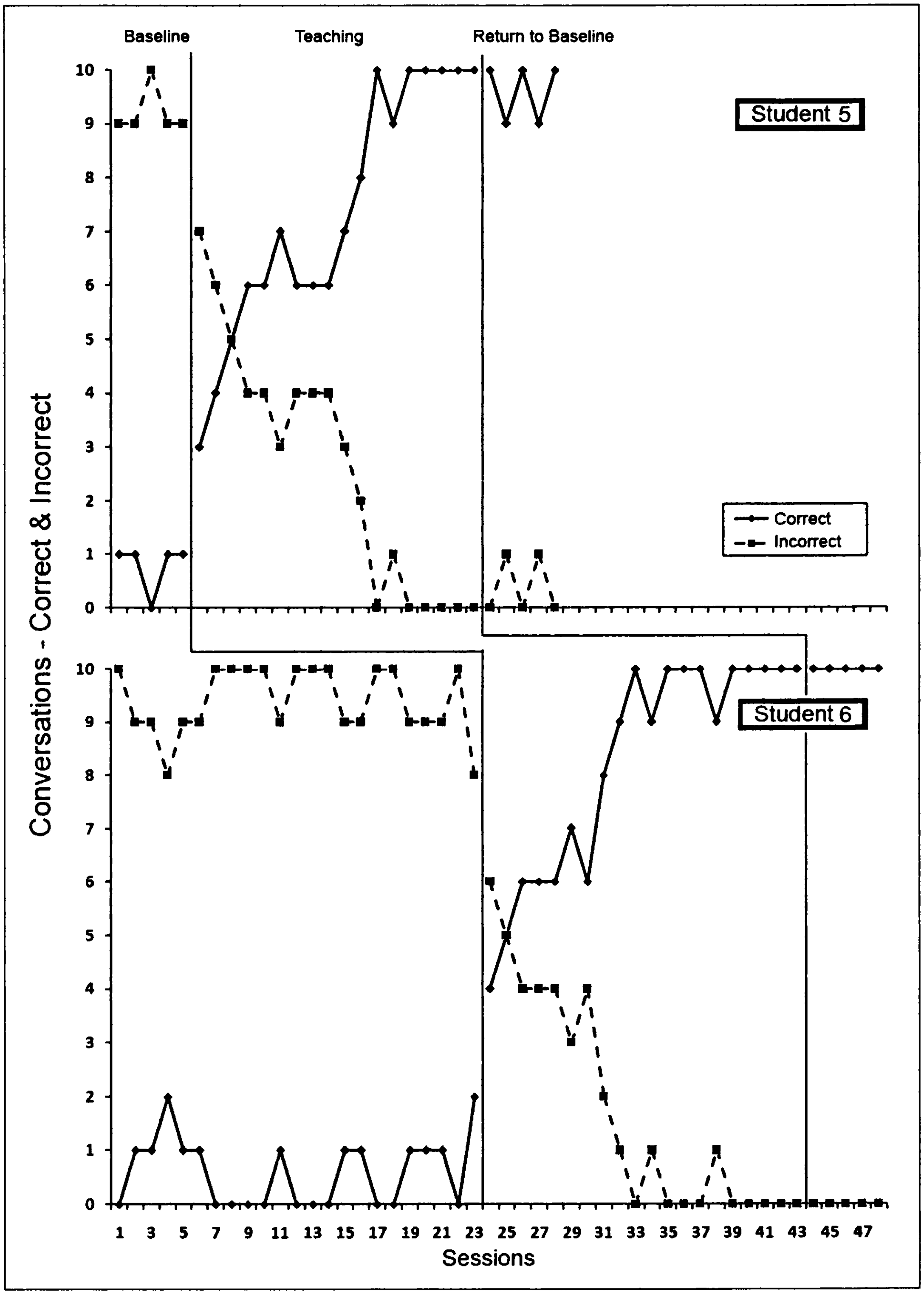


Figure 3.4: Conversations and correct and incorrect across baseline, teaching and return-to-baseline for students 7 and 8.

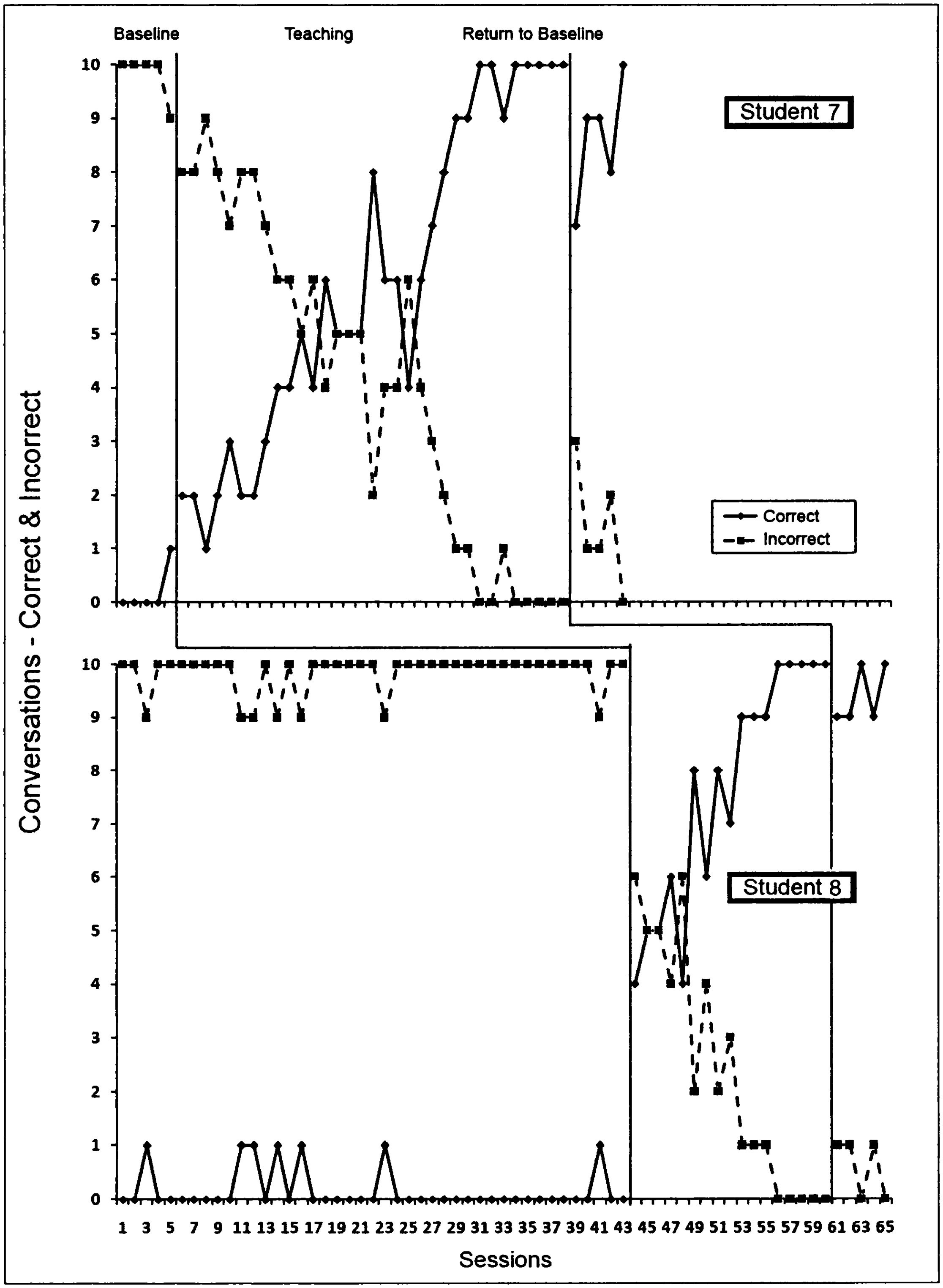
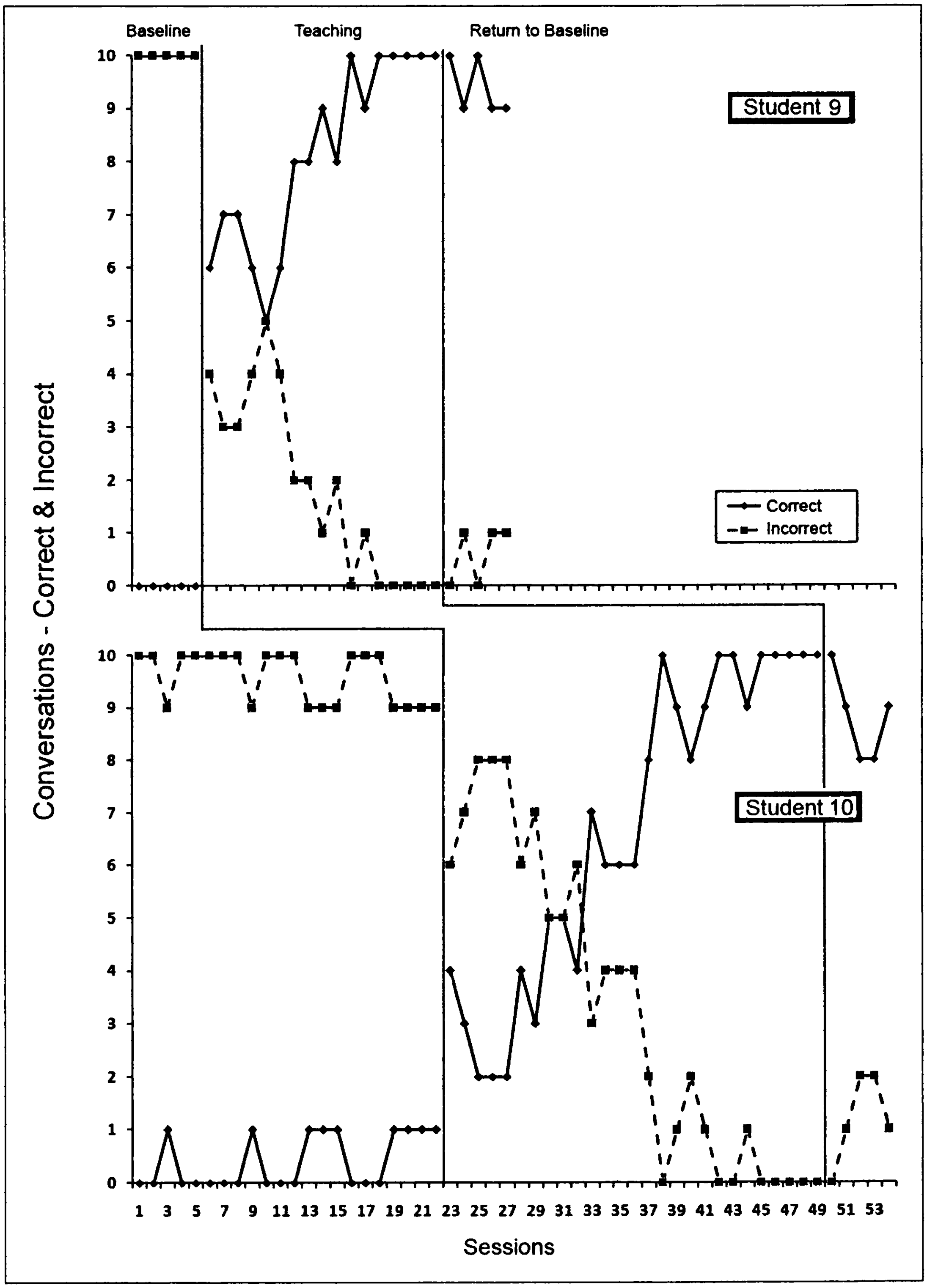


Figure 3.5: Conversations and correct and incorrect across baseline, teaching and return-to-baseline for students 9 and 10.



During the return-to-baseline, run for five sessions for each participant, there were a range of 7 to 10 correct responses emitted across the ten subjects, with a mean of 9.2 correct responses across subjects being recorded, offering evidence that the subjects had learned to independently comment on their play when an opportunity was offered following the completion of a task (see Appendix B for mean and range table for all phases).

The subsequent generalization probes across novel environments, including after school, after programme work, after meals/snack, after watching a video, after listening to music and after outdoor play, designed to evaluate the effectiveness of the 'talk' prompt in untrained situations, are shown in Figures 3.6 to 3.10. These show that the ability to initiate a conversation during controlled instructional opportunities was maintained in untrained novel situations across the day. The ability to generalize these skills suggests that there may be a generative quality to the ability to initiate conversations based upon a participant's ability to tact their emotions.

Figure 3.6: Generalization probes across novel situations for students 1 and 2.

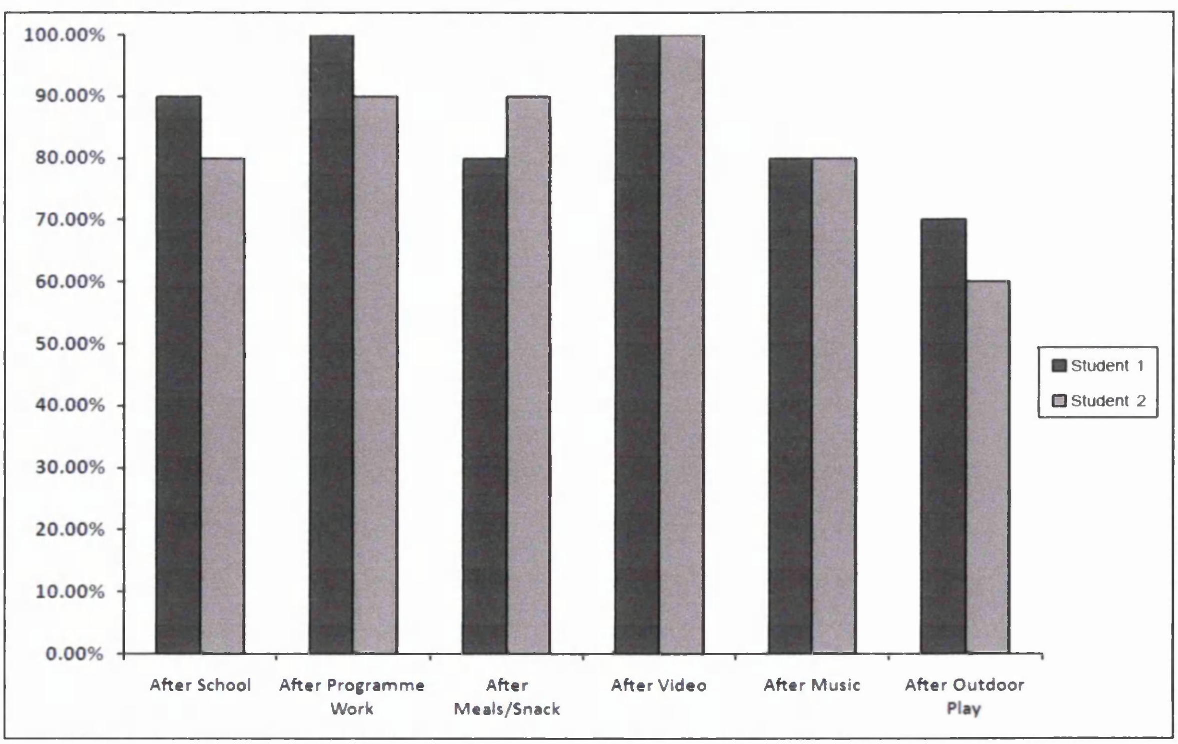


Figure 3.7: Generalization probes across novel situations for students 3 and 4.

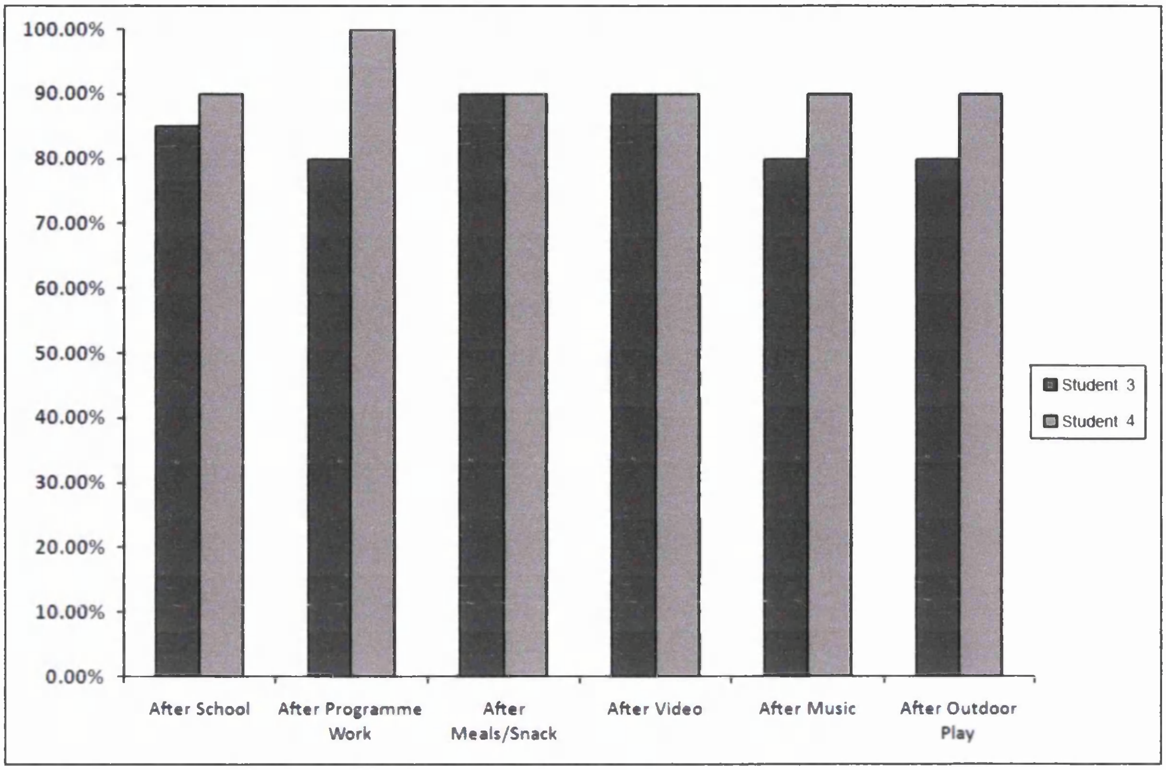


Figure 3.8: Generalization probes across novel situations for students 5 and 6.

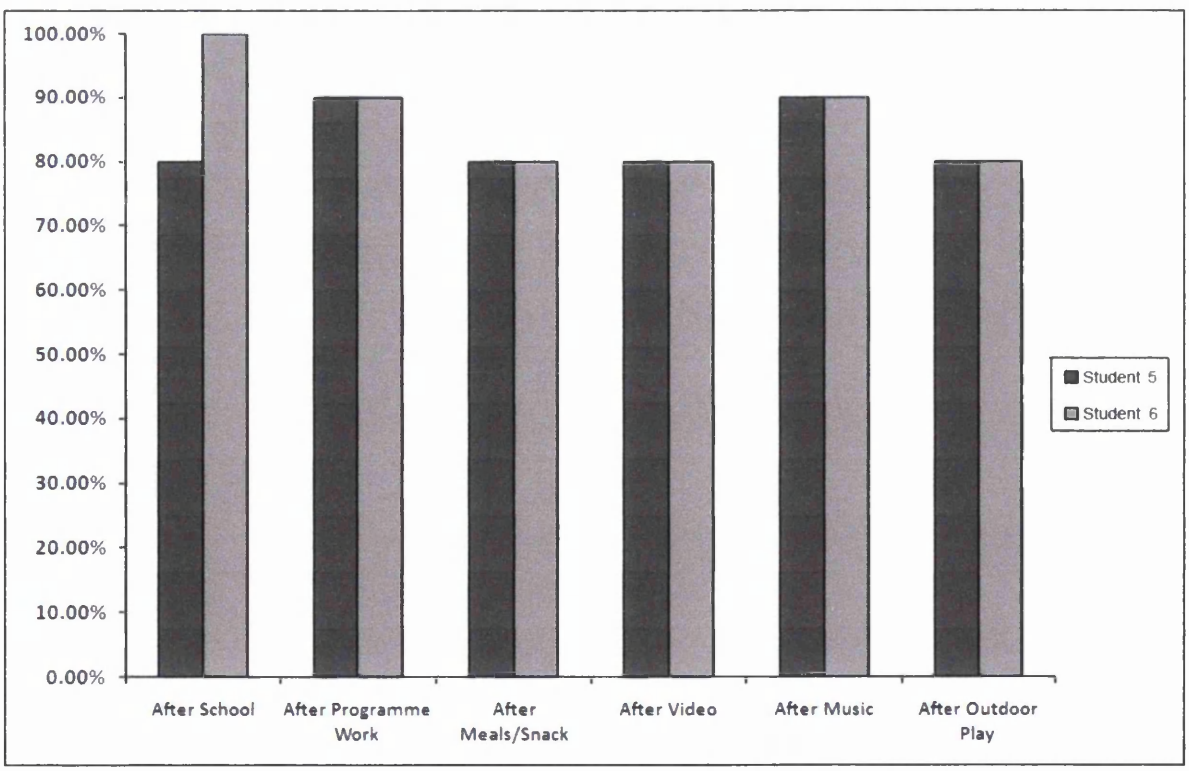


Figure 3.8: Generalization probes across novel situations for students 7 and 8.

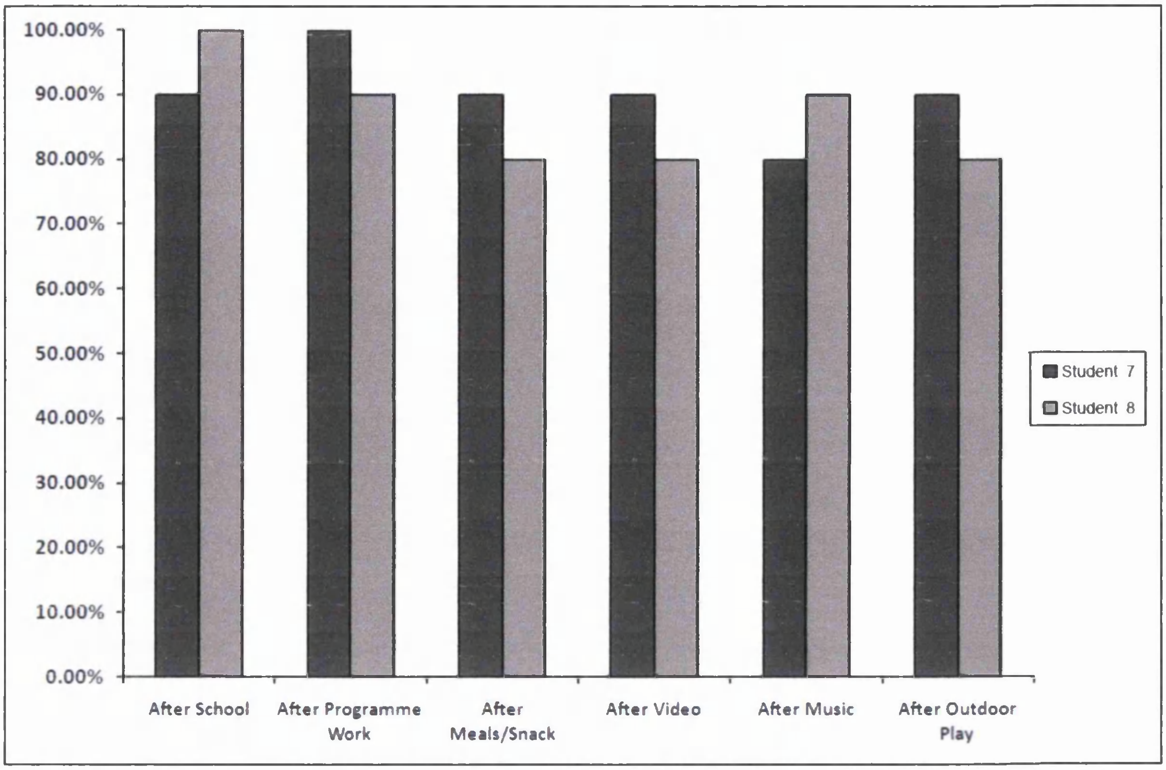
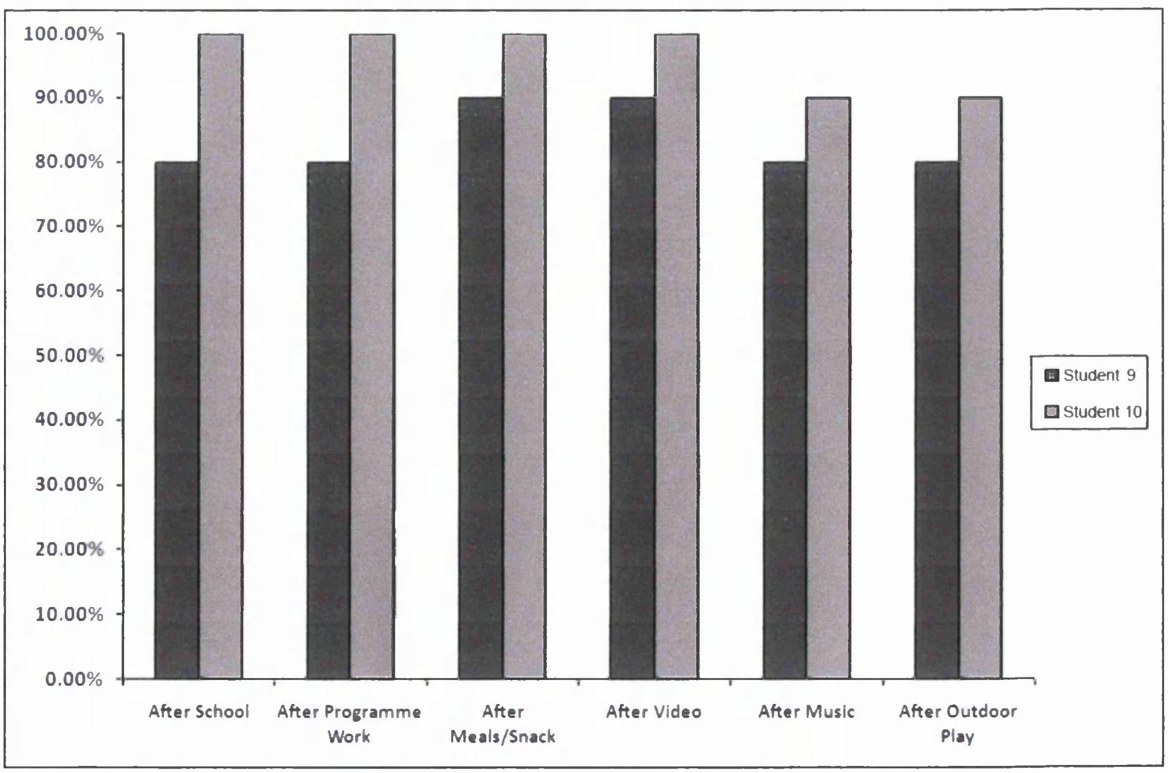


Figure 3.8: Generalization probes across novel situations for students 9 and 10.



3.4 Discussion

This study investigated whether, or not, it was possible teach children with ASD to initiate a conversation by tacting an emotional state (i.e., a *private events*), while extending the conversational unit to increase the number of exchanges. An increase in spontaneous initiations, in novel settings, was also found to be a beneficial further effect of the conversation training, offering evidence that children with ASD can learn to use, and generalize, the language of emotions, when these are systematically taught through direct instruction, while reducing the difficulties they experience with social understanding and social relationships.

The findings of this study suggest that having access to the appropriate language to talk about select emotional and cognitive states enables children with ASD to initiate a structured conversational unit about their individual experience of an activity, previously completed. The data from all ten children showed that the introduction of the 'talk' prompt increased the number of conversational units initiated, which was then maintained in both the return-to-baseline, and generalization, phases: spontaneously initiated conversations increased during teaching, marked by the introduction and shaping of the 'talk' prompt, and then maintained and generalized in subsequent test phases. These data suggest that children with ASD can be taught to initiate a conversation and to use the language of emotional or cognitive states to respond to the way they have experienced the world. This study supports the suggestion that the ability to offer more extensive and sophisticated responses from children with ASD will require explicit teaching and motivating incentives (Capps, Kehres & Sigman, 1999).

Much attention has been placed on improving the communication skills (pure manding and tacting) of children with ASD, as a means of reducing escape, and attention-seeking behaviours (e.g., Scattone, et. al., 2002). In contrast, the approach of this study was to develop a functionality for social-emotional language literacy, which is often found to be absent in ABA approaches (Denham, Lydick, Mitchell-Copeland & Standberg-Sawyer, 1996). The findings of this research seem to support the suggestion that a systematic approach to teaching emotions, and placing it central to a functional communication system, offers children with ASD increased opportunities to understand the expressions and situations for a set of feelings.

Further support for the continued research into the use of visual support, and script fading procedures, to prompt language and social interaction by children with ASD, can also be found in these findings (see also McClannahan & Krantz, 2005). Equally the research suggests that developing the language of emotions in the context of the "conversational unit" offers children with ASD additional opportunity to be reinforced by their verbal community (Donley & Greer, 1993; Lodi & Greer, 1989).

Emotional competence and understanding our emotions is not often addressed in behaviour analytic literature (see Hayes & Wilson, 1993). Yet it has been shown that children become increasingly more capable of using the language of emotions (Fabes, Eisneberg, McCormick & Wislon, 1988), which is thought to be fundamental to a child's ability to form relationships and interact socially (Howes, 1987; Parker & Gottman, 1989; Waters & Sroufe, 1983), when either acquired generatively or taught. It has also been shown that components of emotional competency can predict academic and social success (Izard, Fine, Schultz, Mostow, Ackerman & Youngstorm, 2001; Shields, Dickstein, Seifer, Guisti, Magee & Spritz, 2001). Without an understanding of emotions, and their tacts, the link between feeling and action is not always clear, to either the speaker or the listener. Such competency requires children to tact a set of emotions, identify emotions by situation, and, finally, to infer their causes (Lemerise & Arsenio, 2000).

In a previous study, set of tacts for "*private events*", were shown to function as conditioned reinforcers (see Chapter 2), and this offers some initial evidence that having access to a set of 'tacts for *private events*', could, under certain conditions, function as a conditioned reinforcer when teaching non-preferred activities. Increases in spontaneously emitted language (usually in the form of pure mands and tacts) were also shown to be functionally related to teaching the participants to tact their *private events* during, and after, prescribed play sessions. These data suggest that unique vocalizations, signs, or picture exchanges, can be a relational outcome of intensive tact training. In the current study, a teaching operation to begin that process, by pairing a tact for a *private event* with a situation has been suggested.

Clearly, additional work needs to be conducted to define and measure 'emotional security', the regulation of emotions, and in developing the skills to solve emotion-laden problems, which are all central to emerging emotional competency. Additional study also needs to be undertaken to address the validity of these findings, and to extend the range of emotions under investigation. The present results should be interpreted in the context in which they were measured, and not as an indication that the initiation of conversation under investigation are a generative form of verbal behaviour, but instead as an indication that explicit teaching needs to address the deficits that children with ASD experience in constructing narratives of personal experience. Although there were clearly ascending trends across all phases of instruction, and the corresponding generalization probes, it is important to remember that the environment in which these measures were taken were highly contingent and controlled ABA Home Programme sessions. One area of future research would be to use the "talk" prompt procedure to begin teaching more developed language exchanges, extending the conversational unit, and developing its grammatical correctness.

4 TEACHING CHILDREN WITH ASD TO INITIATE CONVERSATIONS: BUILDING SIMPLE SENTENCES TO TACT *PRIVATE EVENTS* WITH GREATER FLUENCY

4.1 Introduction

Delays in language development, which form part of the triad of deficits in children with Autistic Spectrum Disorders (ASD; American Psychiatric Association, 1994), has long been the focus of research into procedures and techniques designed to remediate this deficiency (e.g., Hart & Risley, 1968; Koegel, 2000; Krantz, Zalenski, Hall, Fenske & McClannahan, 1981; Mundy, Sigman & Kasari, 1990; Mundy, Sigman, Ungerer & Sherman, 1986, 1987; Ross & Greer, 2003; Sundberg & Partington, 1998). With specific difficulty in social language, both as a speaker, and as a listener (Rutter, 1978), children with ASD are often typified as being socially isolated (Frith, 1989; Schuler & Wolfberg, 2000), and as using language that is defined as *idiosyncratic*, *neologistic*, and *dysprosdic* (Schreibman, 2005). The combination of having language that is marked and restricted by such unique features, as well as being developmentally delayed, and pragmatically limited, means that many children with ASD find it difficult to communicate effectively as speakers (Wehterby & Prutting, 1984), and that they more easily learn rote, literal language, as listeners (Warren & Kaiser, 1988).

Given these problems, a central goal of most language-based interventions for children with ASD is to improve their communication skills, increase spontaneous exchanges, and encouraging generative language responses, which have meaning to both the speaker and the listener. Indeed, many such interventions based on Applied Behaviour Analysis (ABA) explicitly focus on the development of these linguistic skills, either through the 'Verbal Behaviour' approach (Sundberg & Partington, 1998), activity schedules (McClannahan & Krantz, 1999), intensive tact and mand training (Greer & Keohane, 2005; Stafford, Sundberg & Braam, 1988), incidental teaching approaches (Hart & Risley, 1968), and the Natural Language

Paradigm (Koegel, O'Dell & Koegel, 1987). However, absent from many of these programmes is a focus on teaching tacts for *private events* as part of a functional communication approach. This would offer an opportunity to imbed the language of 'emotion' into the content of daily conversation, providing a stepping stone to improved emotional literacy, both as speaker and as listener, as it does in the normally developing population (Bretherton, Fritz, Zahn-Waxler & Ridgeway, 1986; Denham & Grout, 1993). Given that emotional recognition and expression may be a central problem for children with ASD, an increased focuse on this aspect of language would appear warranted (Walden & Knieps, 1996). Moreover, such increased linguistic ability concerning emotions has been connected to a range of additional benefits, such as reducing challenging behaviour (Fischer, Piazza, Cataldo, Harrell, Jefferson & Conner; 1993), increased language acquisition (Bloom & Capatides, 1987), and improved mental health (Denham, 1998; Saarni, 1999).

Although there are examples of ABA techniques that have attempted to teach social language in children with ASD (e.g., peer modelling, activity schedules, time delay), these investigations remain relatively overshadowed by those that document procedures aimed at teaching pure tacting (Carroll & Hesse, 1987; Schauffler & Greer, 2006), manding (Michael, 1988, 1993; Rogers-Warren & Warren, 1980), increasing sentence complexity (Krantz, Zalenski, Hall, Fenske & McClannahan, 1981), vocal imitation (Ross & Greer, 2003), use of questions (Williams, Perez-Gonzalez & Vogt, 2003), and the development of first words (Yoder & Layton, 1988). Moreover, such ABA programmes do not, typically, examine techniques that focus on the instruction of language for *private events* and 'emotions'.

In a previous study (see Chapter 3), it was found that children with ASD could be taught to initiate a conversation based on a *private events*, when they were presented with a "talk" prompt card in their visual schedule board. After such training, these children were able to gain the attention of their language partner by offering statements such as: "*puzzles fun*", "*liked colouring*", "*lego boring*", and "*don't like books*". In this latter study, participants were able to tact utterances of up to two words, although they were unable to express an idea linking *private events* to a subject-verb clause. However, it might be noted that such a lack of generative clarity does not necessarily reduce the impact of such utterances on the listener (Capps, Keheres & Sigman, 1999; Palmer, 1996).

Such grammatical responses are, of course, an important part of any person's verbal repertoire. Their absence may reduce the overall rate of vocalizations emitted (Sundberg & Michael, 2001), and the desired *automatic reinforcement* associated with fluent speech (Reed & Howell, 2000; Skinner, 1957; Vaughan & Michael, 1982). Deficits in the probability and rate of spontaneous speech will, in turn, reduce further the likelihood that a child with ASD would initiate a conversation based on emotion (Charlop, Schreibman, & Thibodeau, 1985), and the development of language outside of a functional interactive context will also reduce its generalization (Pierce & Schreibman, 1995; Rogers, 2006). Perhaps because of these reasons *inter alia*, children with ASD often continue to require conversational opportunities to be arranged, as they generally exhibit a disinterest in sharing their comments with others (Lovaas, Koegel, Simmons & Long, 1973), despite being capable of producing more complex and socially meaningful language (Donahoe & Palmer, 1994; Krantz, et. al., 1981; Stevens-Long & Rasmussen, 1974).

In light of this, the current study reflected an attempt to help children with ASD to use *private events* as a feature of more complex sentence constructions, and to measure the appropriate use of correct subject-complement pairings in such utterances. To this end, conversational opportunities were built into a visual play schedule that was designed to prompt the participants to initiate a conversation with a language partner (McDuff, Krantz & McClannahan, 1993; Stormer, Kimball, Kinney & Taylor, 2006). This visual activity schedule included a comment card, with the aim of encouraging a conversational unit based on a *private events* (*fun, boring, hard, easy, liked,* and *don't like*) in the form of a more complex utterance (including a *subject-verb-comment* sequence).

The protocol used in this study was based on earlier ape language studies (see Schiefelbusch & Hollis, 1979), with an instructional sequence which includes imitation and instrumental conditioning, and which suggest that grammar might follow the use of earlier basic semantic communication systems, that have moderate levels of reference, with low levels of perspective taking, and sequential organisation (Miles & Harper, 1994), lacking a theory of mind (Baron–Cohen, Leslie & Frith, 1985). Ape language studies have also shown that after intensive language instruction, the emergence of novel sentence construction, and the generative use of conceptual language, may occur, offering support for the conclusion that conceptual meaning can develop without specific training (Rumburgh & Gill, 1977). Such language emerges despite the participants' lacking strong reference or perspective taking skills. In the current study, it was thought that by teaching a basic set of tacts for *private events*, and then shaping them into linguistically more advanced structures, a transfer of this language to a new member of a class of referents would take place, as seen in earlier ape studies (Gardner & Gardner, 1979), thus, promoting more complex grammatically correct utterances regarding *private events* in children with ASD, which has typically been difficult to train (Sundberg & Michael, 2001).

4.2 Method

4.2.1 Participants

Ten children (8 male and 2 female), between the ages of 5.8 and 9.3 ($M = 6.9$ years) participated in this study. All of the children had been diagnosed by an independent paediatrician with childhood autism, and had Gilliam Autism Rating Scale (GARS) quotients of between 68 and 111 (see Table 4.1).

Table 4.1: Descriptive statistics of selected variables for participants, including age, GARS scores & speaker skills.

Participant	Autistic Quotient	Percentile Rank	Probability/Severity	Speaker Skills
Student 1 - M (5.8 yrs)	70	2%	Below Average	PECS
Student 2 - M (5.9 yrs)	85	16%	Below Average	Vocal Verbal
Student 3 - M (6.7 yrs)	100	50%	Average	PECS
Student 4 - M (6.2yrs)	68	1%	Very Low	PECS
Student 5 - M (7.7 yrs)	80	9%	Below Average	Vocal Verbal
Student 6 - F (5.8 yrs)	93	32%	Average	Vocal Verbal
Student 7 - M (5.8 yrs)	111	77%	Above Average	Vocal Verbal
Student 8 - M (9.1 yrs)	110	75%	Above Average	Vocal Verbal
Student 9 - M (6.8 yrs)	85	16%	Below Average	Vocal Verbal
Student 10 - F (9.3 yrs)	110	75%	Above Average	Makaton

All participants were receiving home-based ABA instruction (designed as a component programme of the CABAS® systems approach to education; see Greer, 2002), which also included part-time placements in mainstream and special education schools. Students 1, 2, and 3 were in full time special schools; Students 4, 5, 6, 7, and 8 were in school for a three-hour morning session; and Students 9 and 10 attended a two-hour afternoon session. All of the children communicated through an augmented use of a picture symbol system, and had some Makaton Signs (manual sign), in their repertoires. Six of the children (Students 2, 5, 6, 7, 8, and 9) used increasingly more vocal verbal behaviour to mand and tact, two of the children were beginning to vocalize with meaning (Students 1 and 3), while two (Students 4, and 10) did not use vocal verbal behaviour to communicate, and had only a limited range of sounds and oral motor functions.

All ten participants had been taught to tact *fun*, *boring*, *easy*, and *hard*, and to confirm their response with a *yes* or *no* response, using both vocal verbal behaviour and symbols, as part of a previous study (see Chapter 2). These children had also been taught to respond to a "talk" prompt, by initiating a conversational unit with a language partner, commenting on a play activity after completion. In addition, the participants were all reliably using *yes* and *no* in response to "is this", and when manding "more", with vocal verbal behaviour and symbols as was appropriate for each participant.

4.2.2 Setting and Materials

The research was conducted in each of the participants' homes, and was designed to be fully integrated into their Home-Based ABA programmes. Typically, each room where the training was conducted contained a work table, and a set of chairs, programme materials, and a book case, on which toys, and reinforcers, were clearly displayed in transparent bins, labelled with picture symbols identifying what materials were contained in each box.

A schedule board was visibly displayed in each of the session rooms (PECS Schedule Board), and a set of colour symbol cards (2 inch by 2 inch), for each of the play activities with a Velcro® back, were arranged in a schedule book (picture symbols cards were made using Meyer-Johnson Board Maker). The conversation prompt "talk" cards were included on the visual schedule, placed between each activity card, during baseline and teaching phases, with pre-selected conversation response cards included in the PECS book. These cards included symbols for *private events* (either *fun*, *boring*, *like*, *don't like*, *hard*, and *easy*), the symbols for *yes* and *no*, and the select subject and compliment cards required to form complete sentences. The conversation prompt cards were designed to prompt the child to initiate a conversational unit.

4.2.3 Behaviour Definitions (Dependent Variables)

4.2.3.1 Forming Subject-Compliment Sentence Strips

During the teaching phase (B), a correct response was defined as retrieving a symbol card for the *private events* (*fun, boring, easy, hard, liked,* and *don't like*), and creating a subject-complement relationship between *private events* and task completed (e.g., "*connecting puzzles was fun*", "*I liked reading books*", "*building lego was hard*"). A correct response was one which included the symbol for the play activity just completed, an action card for that activity (e.g. *build* for lego, *connect* for puzzle, etc.), and a *private events* symbol of the child's choice. This teaching was followed by a confirmation response, in which the child was asked to confirm their initiated statement, which required the response: "*yes, puzzles were fun*".

4.2.3.2 Conversational Unit

During the teaching phase (B), the child was required to organise a sentence strip forming a complete sentence, drawn from a selection of symbols in the PECS book, which includes symbols for tacts (e.g. *fun* and *boring*, *easy* and *hard*, *liked* and *didn't like*), activity pictures (e.g. puzzles, Duplo®, colouring, spelling, sums, etc.), distracter cards (a mixture of nouns and verbs), action words (e.g., 'played', 'building', 'played'), and the symbol for *yes* and *no* (textual cards). A conversational unit scored correct, required the participant to exchange a grammatically correct sentence strip (*speaker*), maintain eye contact with the language partner, and attended to the listener's response (*listener as speaker*), to be scored as a communicative response. An incorrect conversational unit was one where a grammatically incorrect sentence was offered, eye contact wasn't maintained, or the language partner's reply wasn't listened to or answered.

Each initial conversational unit was followed by a question of confirmation, which was scored to verify that the child's emitted tact matched the child's perception of the meaning of the *private events*. If a sentence strip was exchanged which read "*I liked building with lego*", the language partner would then offer social praise to the child and ask, "*Did you like building with lego?*" If the child replied "*yes*", it was scored as a correct match (e.g. *private events* in the initial sentence was confirmed in a *yes/no* follow-up exchange); if the child replied "*no*", then the *private events*, and the follow-up question would not have been a match, and a minus would have been scored. When the initial comment matched the question of confirmation, the conversation unit was scored as correct. If appropriate eye contact was not maintained then the conversational unit was also scored as incorrect.

4.2.3.3 Generalization Probes

Following a return-to-baseline, a generalization probe was conducted to determine whether the children could form subject-compliment sentences across a selection of non scheduled activities, including: after school, after programme work, after meals/ snacks, after video, after music, and after outdoor time. With subject and compliment symbols in the PECS book, participants were offered the opportunity to initiate a conversation by selecting the appropriate symbol card for exchange subject-compliment, to include the activity, and a *private event.* Initiations were scored correct if they included a tact for a *private events*, and the activity symbol (e.g., "*school was fun*") that was deemed appropriate for each opportunity. Correct and incorrect sentences and conversational units were identical to the conditions above. A total of ten opportunities for each generalization probe were counted.

4.2.4 Experimental Design and Measurement

A multiple-baseline with full reversal followed by a generalization probe (ABAC), to assess the effectiveness of the procedure to increase sentence length and promote the use of specific tacts for *private events* of child initiated conversational units across novel settings, was used in this study. The conversational unit was then extended by including a *yes* or *no* question to confirm the speaker's initial comment. Data sheets were separated into two columns, one each for correct initiations and incorrect initiations. A third column of correct and incorrect responses for was used to record the confirmation (yes/no) response. All measures were recorded as individual events. Each conversational unit (speaker-listener, listener as speaker) was considered a *Learn Unit* (see Greer, 2002), defined as a three-term interlocking contingency between child and teacher, which included an antecedent, a behaviour, and a response for both the child and teacher.

4.2.5 Baseline (Building a Simple Sentence)

With the "talk" prompt in place, the form of the response was considered in this study, and a measure of correct subject-compliment usage was taken (including a measure of word choice and word order). During the baseline phase, children were offered the opportunity to expand upon their initiations, by including subject, verb, and comment (*private events*), symbols onto a sentence strip. The additional symbol cards were made available, along with distracter cards (a selection of noun an verb cards reflecting vocabulary already in the participants repertoires), to the children during this phase. Conversation opportunities were arranged between scheduled 10-minute play periods, and prompted by the inclusion of the "talk" card on the schedule board, which were organised with the participants prior to each session.

4.2.6 Teaching (Shaping Subject-Verb-Comment Sentence)

During the teaching phase, the baseline conditions were maintained, with the "talk" card on the visual schedule and the additional subject, verb and comment (*private events*) cards on view, with the addition of a full physical/echoic prompt to shape the appropriate response to the 'talk' card, and the conversational unit. In this phase, the language partner physically prompted the child to build a sentence, offered two choices for each subject and verb (e.g. lego & chair with building, & eating, puzzles & dogs with connecting & sleeping, etc), and six choices for the comment (*private events*, i.e. *fun*, *boring*, *liked*, *don't like*, *easy* & *hard*). These were modelled with a full echoic response, which was then faded after five consecutive session of 100% correct responding.

In this phase, the presentation of the sentence strip to the language partner was considered a conversational initiation, which was followed by a validating question, which required a yes or no reply.

4.2.7 Return-to-Baseline

During the return-to-baseline phase, the "talk" prompt card remained on the schedule board between each play activity, and the choice board for *private events* responses remained available. Subjects were required to retrieve and exchange the "talk" card independently, and to initiate the conversational unit with a complete sentence to include a *private event,* commenting on the previously completed play activity. Each step require and exchange, appropriate eye contact and a vocalized response where appropriate.

4.2.8 Generalization Probe

During the generalization probes, the baseline conditions were maintained during untrained activities across the participant's day. Conversation opportunities included after school, after programme work, after snack or meals, after video, after music, and after outdoor play. During these times, the participant responded to the "talk" card in the visual schedule by initiating a conversational unit, forming a simple sentence, which included a subject-verb-comment sequence. These opportunities were presented in random order across all of the participants. The conversational unit was defined as the exchange of the sentence strip, while maintaining eye contact, followed by a yes or nor question validating the initiation.

4.2.9 Inter-Observer Agreement

Inter-observer agreement was calculated using Cohen's Kappa to control for chance agreements, calculated across 100% of the sessions for each of the children (see Table 4.2). The Cohen's Kappa for the Baseline (A) had a mean across participants of 0.84, and ranged from 0.56 to 1.0; for Teaching (B), the mean was

0.89, and the range was between 0.64 to 1.0; for the Return-to-Baseline (A), the mean was 0.92, and the range was between 0.68 and 1.0.

Table 4.2: Inter-observer agreement across baseline, teaching and return-to-baseline phases, reported as Cohen Kappa.

Inter-observer Agreement: Study Phases			
	Baseline (A)	Teaching (B)	Return/BL (A)
Student 1	0.98	1.0	0.90
Student 2	0.96	0.66	0.89
Student 3	1.0	0.68	0.96
Student 4	0.58	0.98	1.0
Student 5	0.75	1.0	1.0
Student 6	0.96	1.0	0.68
Student 7	0.98	0.98	0.92
Student 8	1.0	1.0	0.88
Student 9	0.56	1.0	0.94
Student 10	0.62	0.64	1.0

Agreement for the "Generalization Probes" (C) across subjects during the *After School* probe had a mean of 0.90, and ranged between 0.57and 1.0; the *After-Programme Work* probe had a mean of 0.92, and ranged from 0.58 to 1.0; for *After Meal/Snack*, the mean was 0.92, and the range was between 0.68 to 1.0; for *After Video*, the mean was 0.84, and ranged between 0.56 and 1.0; for *After Music*, the mean was 0.90, and ranged between 0.76 and 1.0; and for the *After Outdoor Play* probe, the mean was 0.96, and it ranged from 0.74 to 1.0. Thus, agreement was high for all participants in all phases of the study.

Table 4.3: Inter-observer agreement across the generalization probes, reported as Cohen Kappa.

Inter-observer Agreement: Generalization Probes						
	Post - School	Post - Work	Post - Meals	Post - Video	Post - Music	Post Outdoor Play
Student 1	0.96	0.88	1.0	1.0	0.76	0.94
Student 2	1.0	0.86	0.96	0.98	0.78	1.0
Student 3	0.92	0.98	1.0	0.64	0.85	1.0
Student 4	1.0	1.0	0.69	1.0	1.0	0.98
Student 5	0.57	1.0	1.0	0.74	0.88	1.0
Student 6	1.0	0.98	0.92	0.88	0.96	1.0
Student 7	1.0	0.98	1.0	0.75	1.0	0.74
Student 8	0.92	1.0	0.68	0.80	0.98	1.0
Student 9	1.0	0.92	1.0	0.56	0.87	0.98
Student 10	0.62	0.58	0.92	1.0	0.96	1.0

4.3 Results

The results presented in Figures 4.1 to 4.5 show the responses of Participants 1 to 10 in the Baseline (A), Teaching (B), Return-to-Baseline (A), and Generalization probes across novel situations (C). Overall, the results show that: (a) the introduction of the "talk" card, designed to prompt the conversational unit, was an effective means to teach the participants to engage in a conversation with their 'language partner', (b) conversations based on *private events* could be initiated by children with ASD, and (c) that these conversations could then be generalized to novel situations.

Figure 4.1: Grammatically correct and incorrect conversations correct and incorrect across baseline, teaching and return-to-baseline for students 1 and 2.

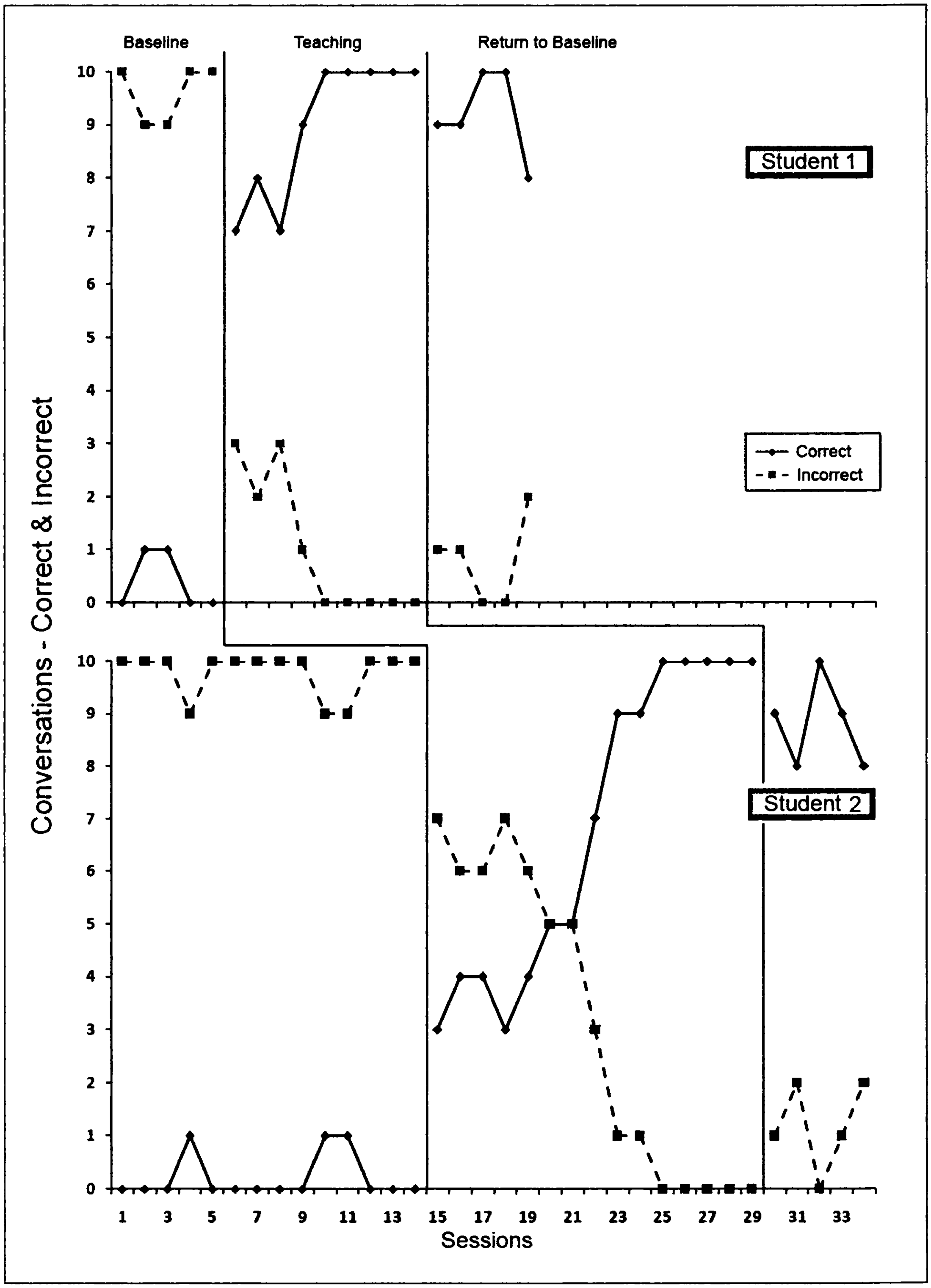


Figure 4.2: Grammatically correct and incorrect conversations correct and incorrect across baseline, teaching and return-to-baseline for students 3 and 4.

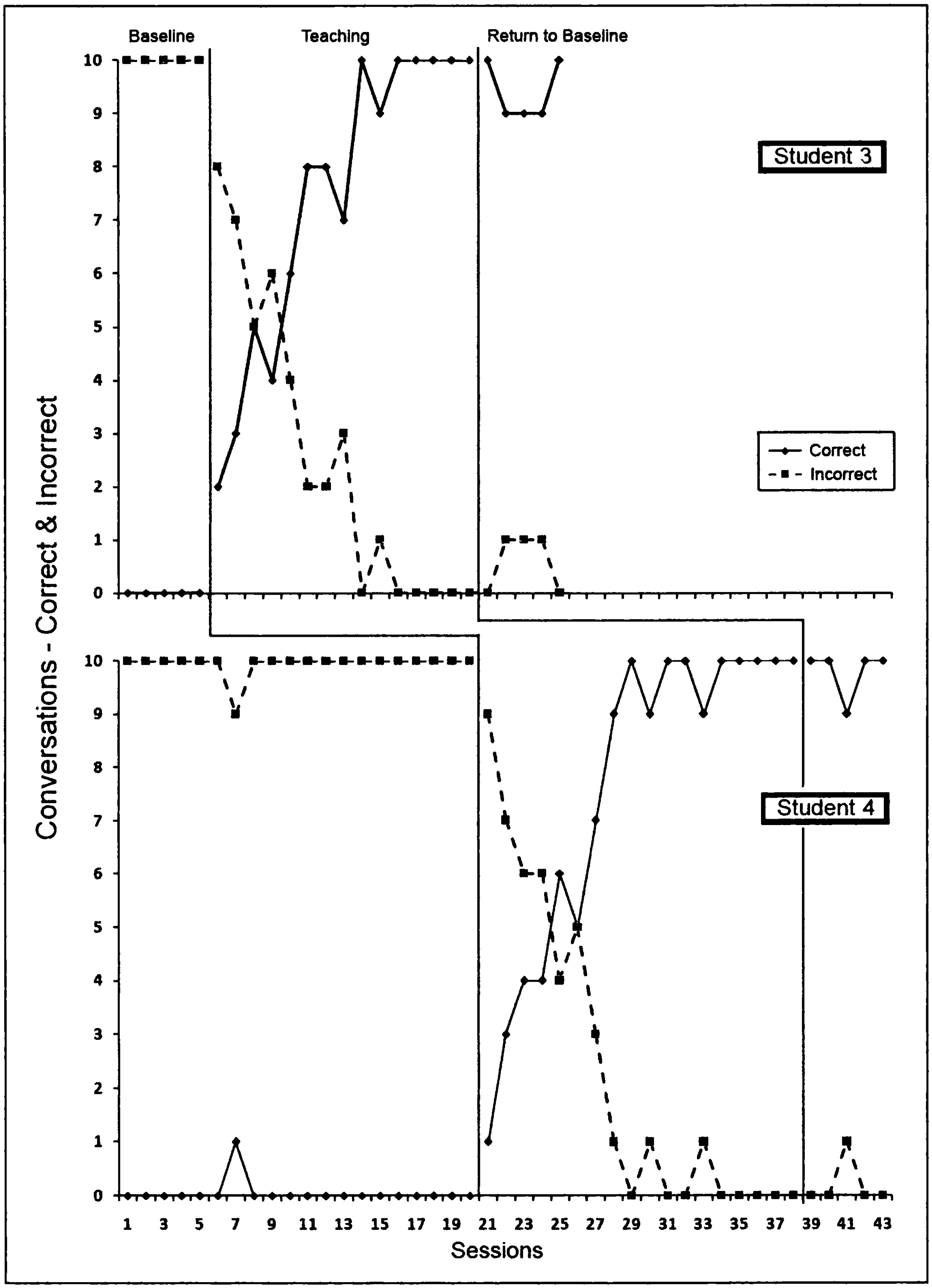


Figure 4.3: Grammatically correct and incorrect conversations correct and incorrect across baseline, teaching and return-to-baseline for students 5 and 6.

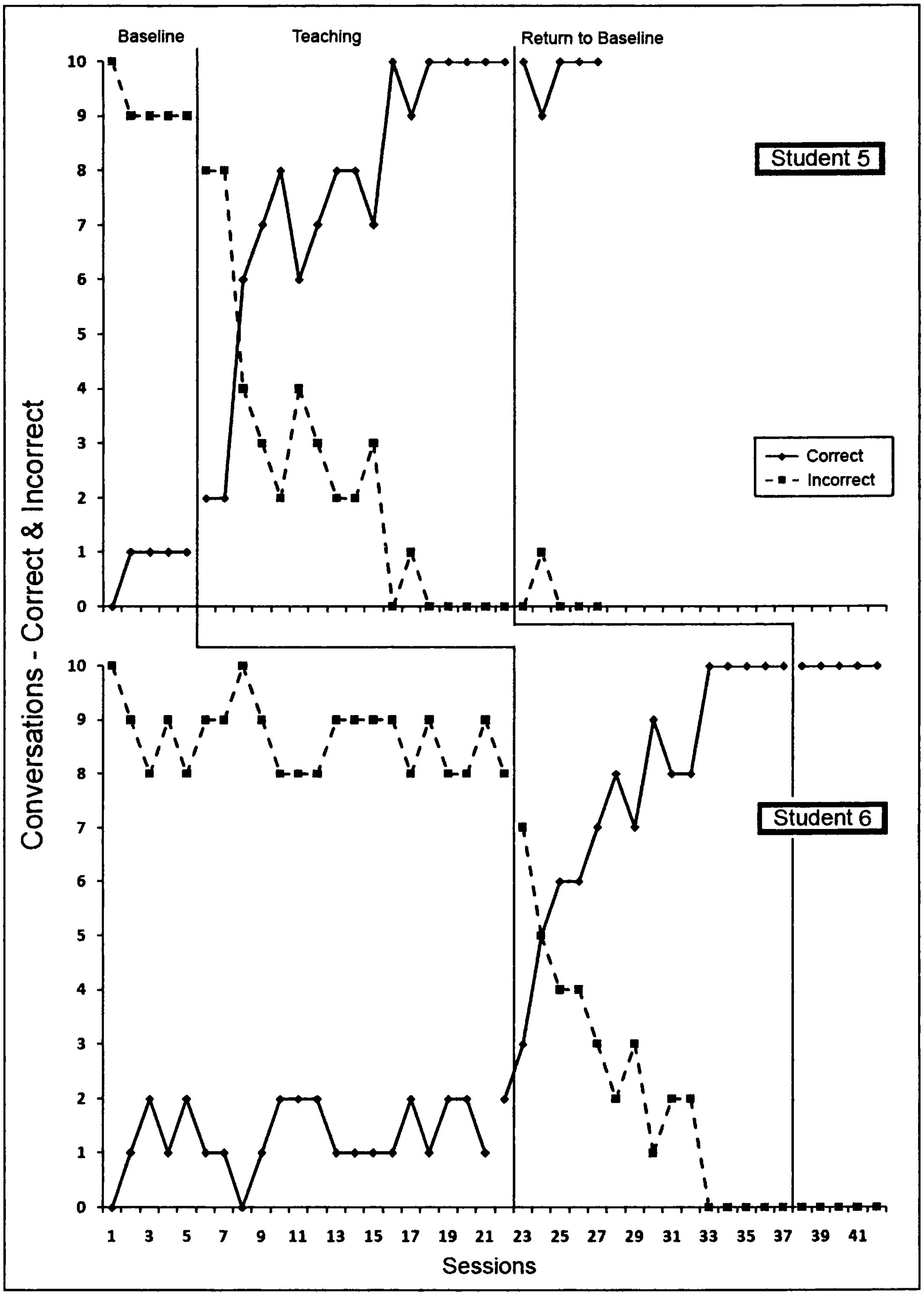


Figure 4.4: Grammatically correct and incorrect conversations correct and incorrect across baseline, teaching and return-to-baseline for students 7 and 8.

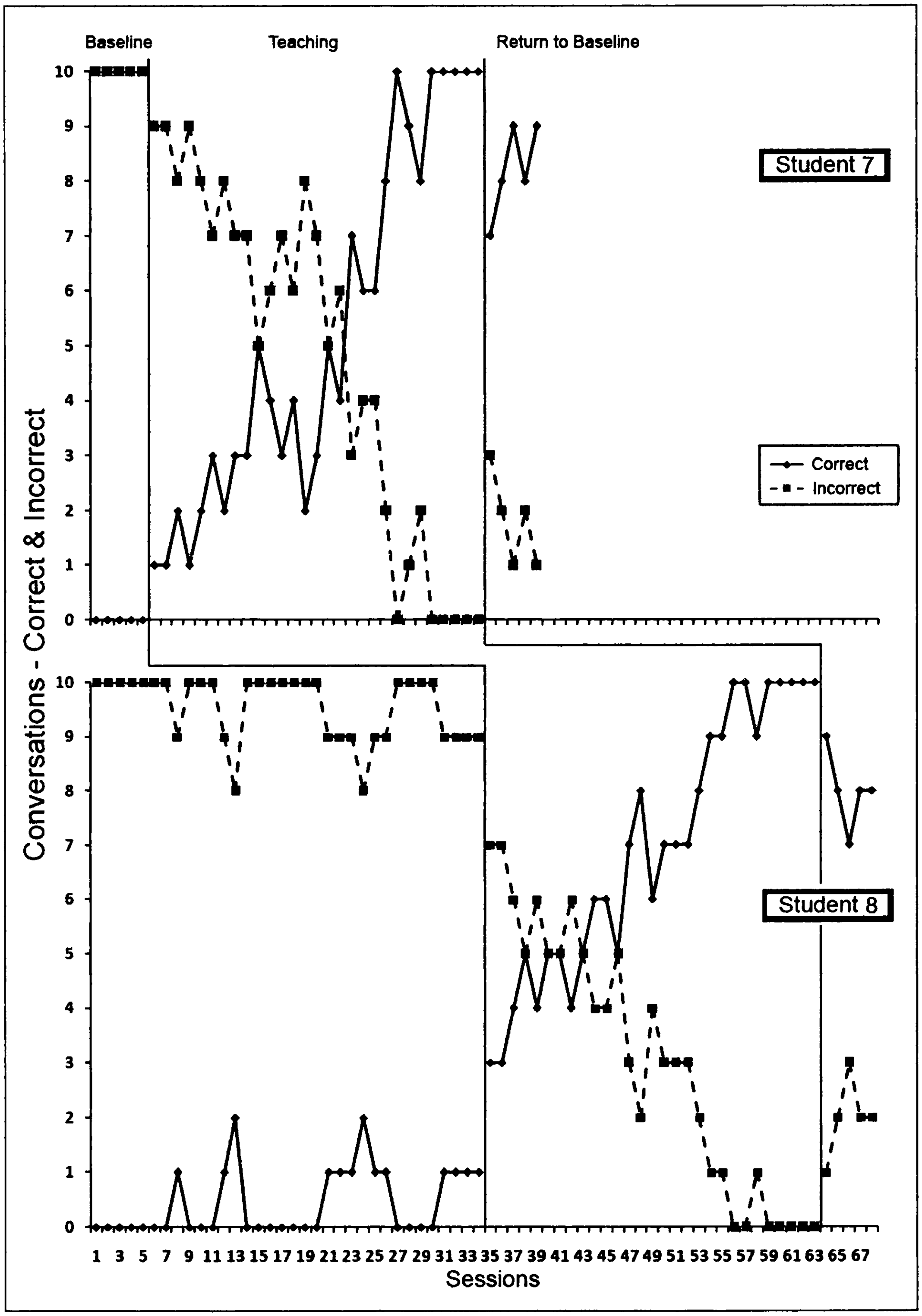
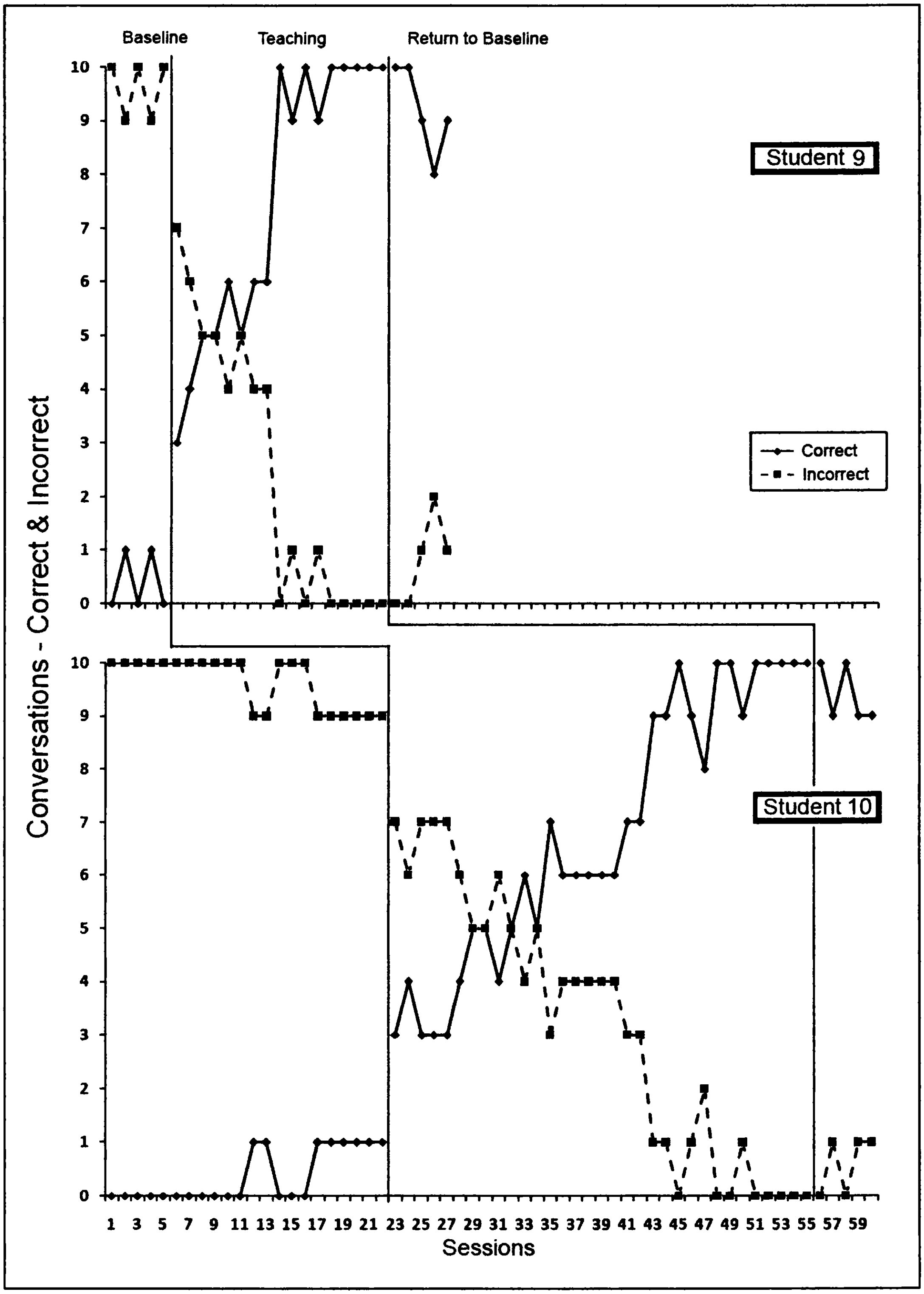


Figure 4.5: Grammatically correct and incorrect conversations correct and incorrect across baseline, teaching and return-to-baseline for students 9 and 10.


Baseline
Teaching
Return to Baseline
Student 9
Student 10
Correct
Incorrect
Conversations - Correct & Incorrect
Sessions

During the Baseline (A), a range of 0-2 correct responses were emitted across the ten participants, in response to the untrained "talk" card being presented in between the structured ten-minute play tasks. During this phase, a mean of 0.3 correct responses across participants were recorded per session, suggesting that the participants were not able to independently respond to a prompt to "talk" about the activity that they completed immediately prior to the presentation of the "talk" card.

During the teaching phase (B), correct responses were emitted with increased frequency across training by the ten participants, as the participants learned to respond to the "talk" prompt, which was presented following each play activity. A mean of 7.5 correct responses across participants per session was recorded, and correct responses increased across the teaching phase from a mean of 2.6 correct during the first session, to a mean of 10 correct by the end of the teaching phase.

During the return-to-baseline phase (C), conducted for five sessions for each participant, there were a range of 7 to 10 correct responses emitted across the ten subjects, with a mean of 9.2 correct responses across subjects being recorded, offering evidence that the subjects had learned to independently comment on their play when an opportunity was offered following the completion of a task (see Appendix C for mean and range table for all phases).

Figure 4.6: Generalization probes across novel situations for students 1 and 2.

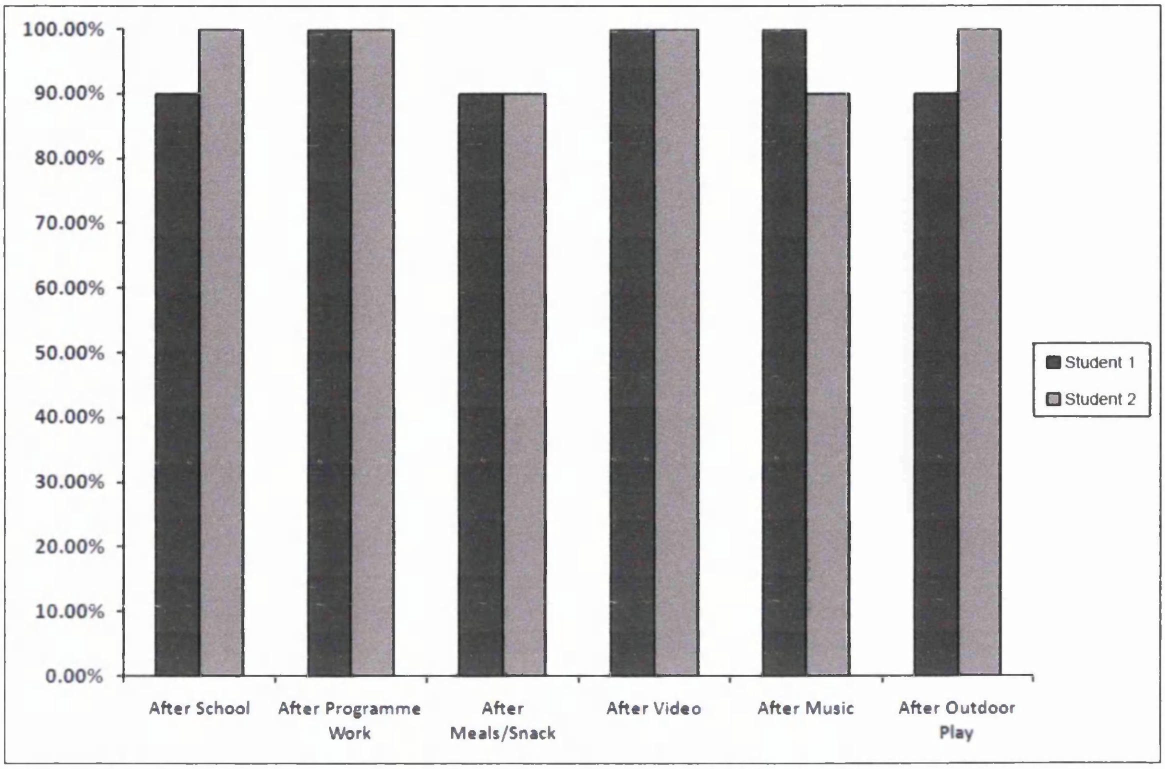


Figure 4.7: Generalization probes across novel situations for students 3 and 4.

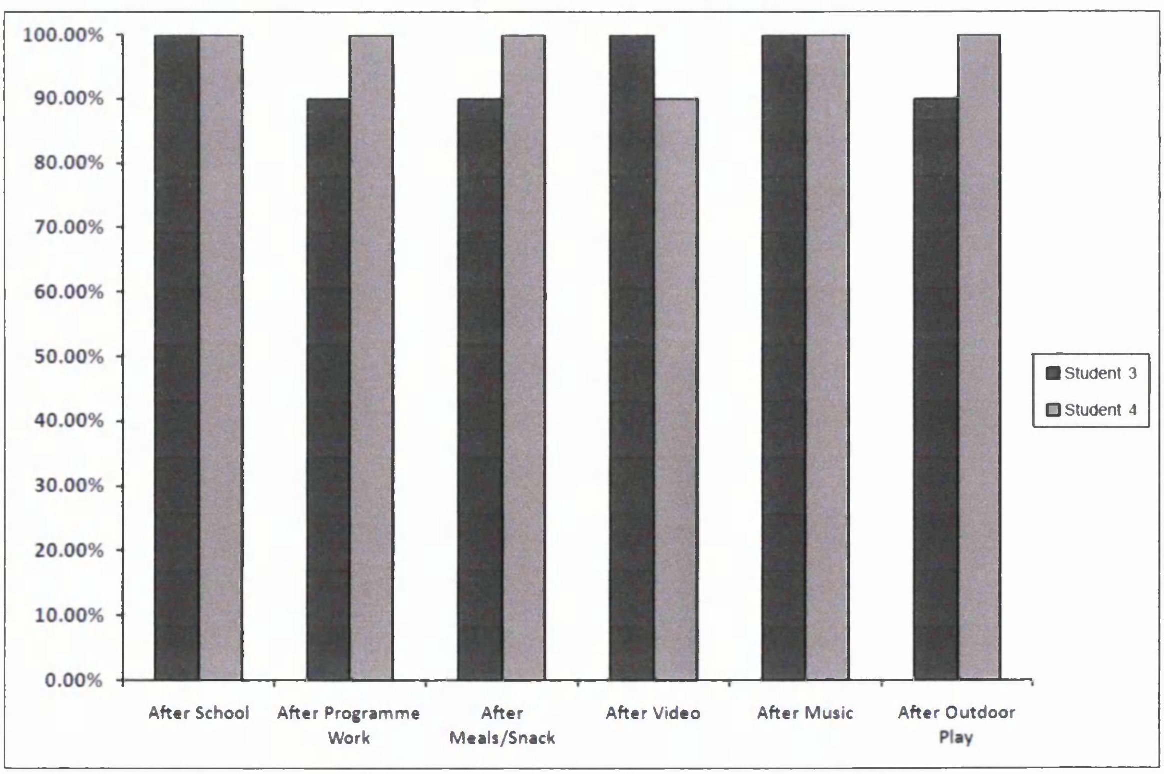


Figure 4.8: Generalization probes across novel situations for students 5 and 6.

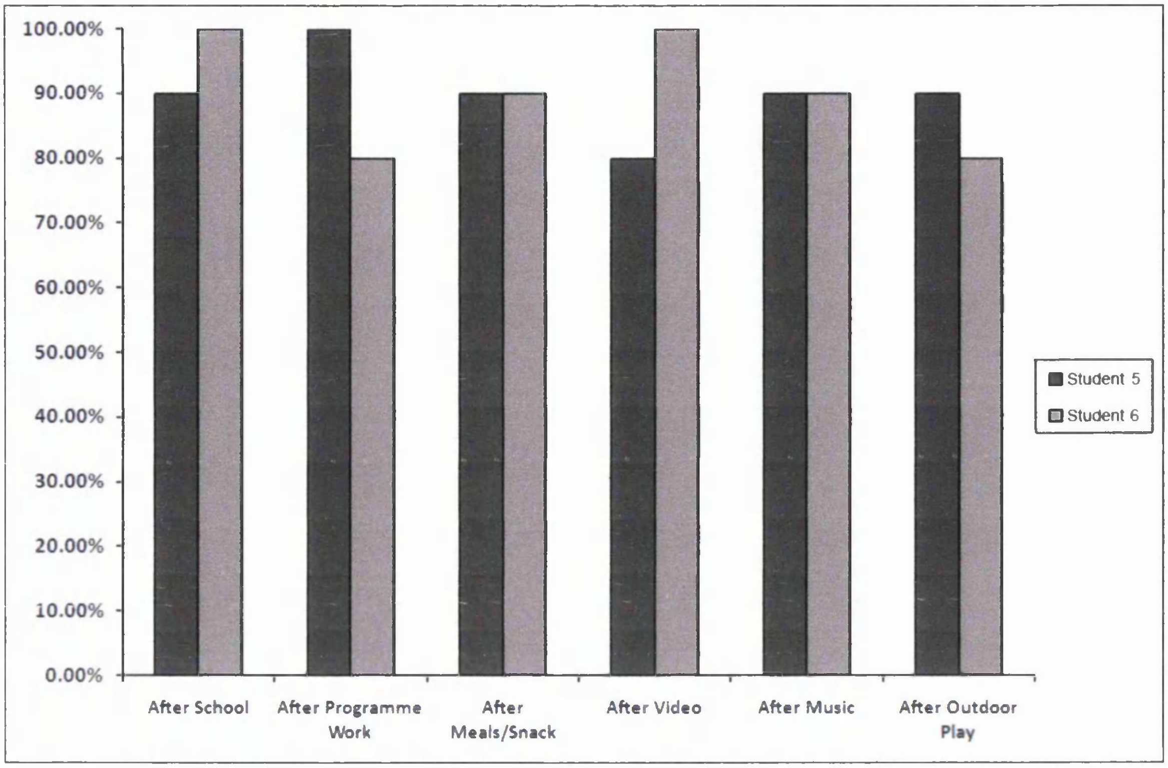


Figure 4.9: Generalization probes across novel situations for students 7 and 8.

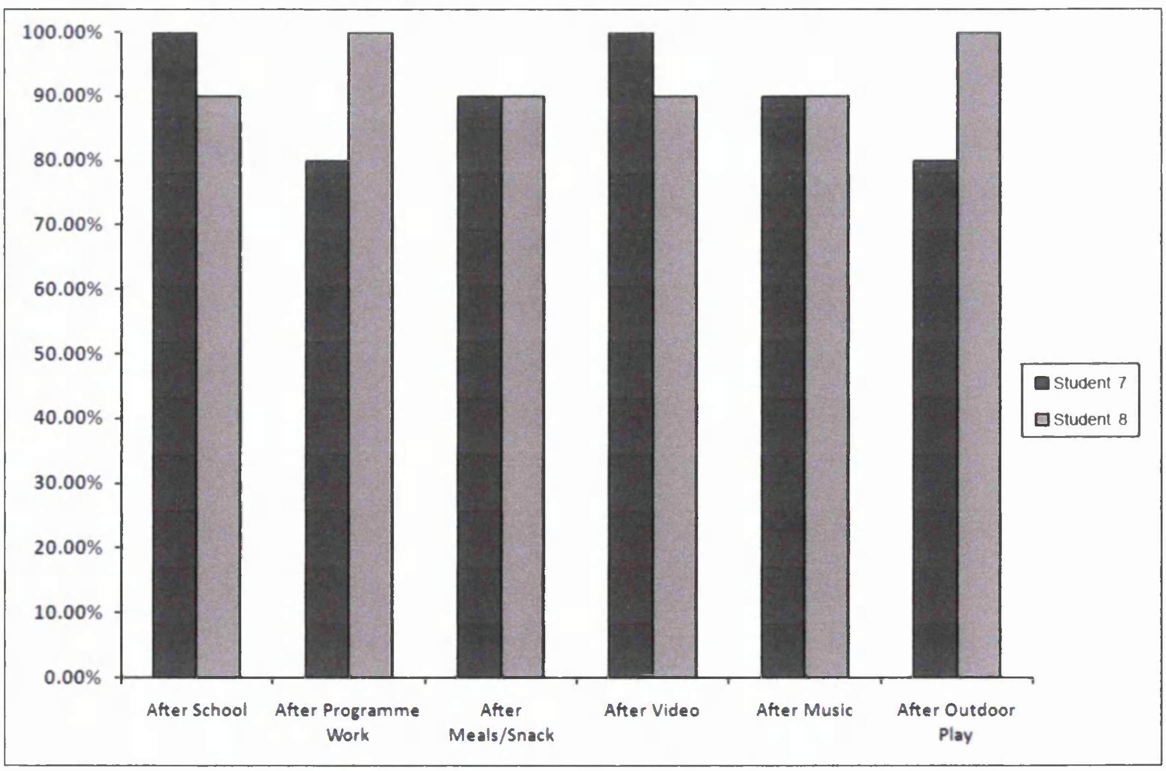
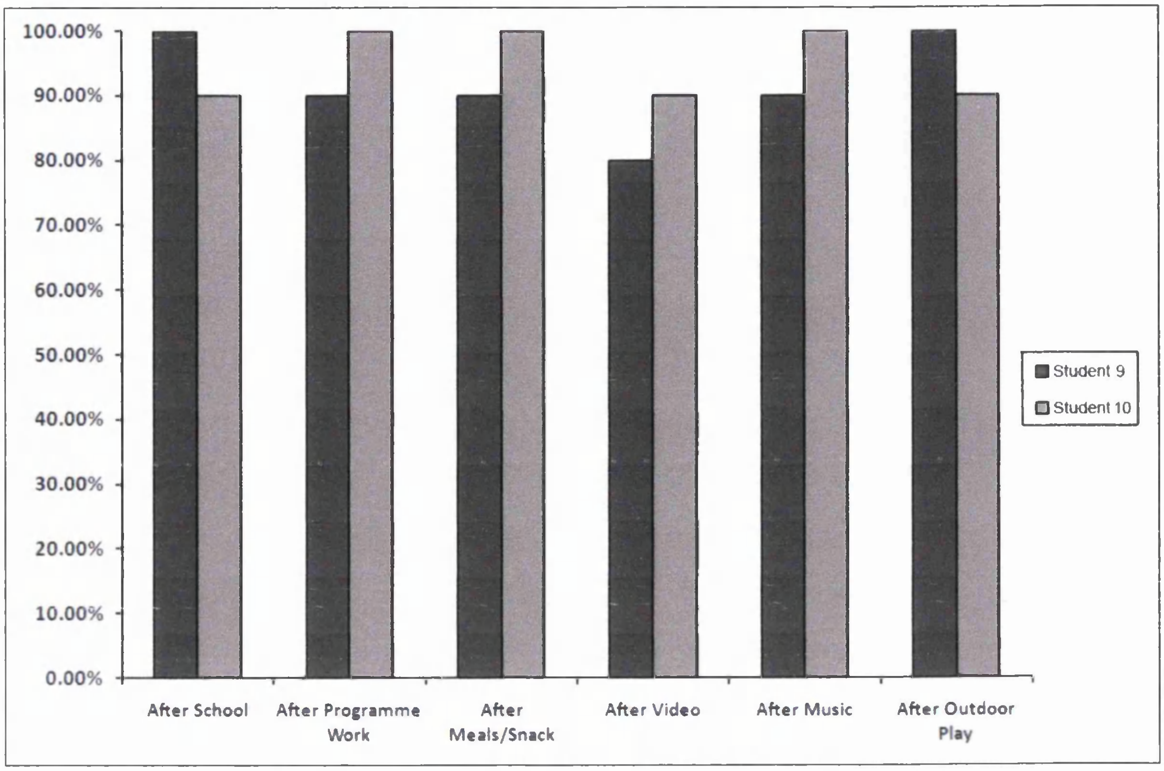


Figure 4.10: Generalization probes across novel situations for students 9 and 10.



The subsequent generalization probes across novel environments, including after school, after programme work, after meals/snack, after watching a video, after listening to music and after outdoor play, designed to evaluate the effectiveness of the "talk" prompt in untrained situations, are shown in Figures 4.6 to 4.10. These show that the ability to initiate a conversation during controlled instructional opportunities was maintained in untrained novel situations across the day. Rates of unprompted grammatically correct utterances had a mean of 94% correct across all situations for all the participants. The means for individual situations ranged from 92% to 96%, with greater success both after school and following programme work. This may be due to the more contingent nature of those opportunities, as they follow highly structured and familiar times during the participant's days. Less success was seen during those opportunities that followed meals, video and outdoor play. This may indicate that the less structured and contingent times during the participant's day are also their less preferred.

4.4 Discussion

This study investigated whether, or not, it was possible teach children with ASD to initiate a conversation based on a tact for a *private events*, while extending the sentence length of the initiation. The results suggested that children with ASD can be taught to extend the grammatical complexity of social language, and incorporate the basic language of emotions (tacts for *private events*), when they are systematically taught through direct instruction and modelling, thereby reducing the difficulties they experience with social understanding and social relationships. A measure of generalization across untrained settings and activities was also taken, offering evidence that an increase in spontaneous initiations was an additional benefit of the conversation training.

The findings of this study suggest that, by having opportunities to use increasingly complex language during structured conversational breaks, the linguistic skills of children with ASD can be effectively improved in the context of socially appropriate exchanges. The data from all ten children showed that the social initiations of children with ASD, to include a subject, verb, and comment (*private events*), increased during instruction, and was then maintained in both the return-to-baseline, and generalization, phases. Spontaneously initiated conversations increased during teaching, in response to the previously conditioned response to a '*talk*' prompt placed between tasks in a visual schedule (see Chapter 3), after which sentence building was modelled by a language partner. This skill was then maintained and generalized in subsequent test phases. These data suggest that children with ASD can be taught to extend their linguistic skills, while using the language of emotional or cognitive states to respond to the way they have experienced a previously completed play task. These findings support the suggestion that the ability to offer more extensive and sophisticated responses from children with ASD will require explicit teaching and motivating incentives (Capps, Kehres & Sigman, 1999).

Language is taken as a foundation of many of our social behaviours, impairments of which are a core feature of ASD (Volkmar & Klin, 1993). Behavioural interventions to improve these skills, conducted since an early study by Wolf, Risley, and Mees (1964), have continued to advance our knowledge of the unique linguistic and social behaviours exhibited by those with ASD. As a consequence, understanding of the functionality of the listener and speaker, the verbal operant (Skinner, 1957), and the *mand* and *tac*t, have been tested and analysed (see Greer & Ross, 2008 and Sundberg & Michael, 2001). In contrast, the use of social-emotional language, which is often found to be absent in ABA approaches (see Denham, Lydick, Mitchell-Copeland & Standberg-Sawyer, 1996), and its effectiveness when teaching complex linguistic skills, has been little discussed. The findings of this research seem to support the suggestion that a systematic approach to using tacts for *private events* to teach commenting skills, while shaping more complex language, offers children with ASD increased opportunities to be practice social language skills.

The success of teaching grammar to children with ASD through ABA techniques has been well described (Sulzer-Azaroff & Mayer, 1991; Sundberg & Partington, 1998), while the ability to generalize these skills across contexts remains challenging (Hwang & Hughes, 2000; Ozonoff & Miller, 1995). The current approach derived from ape language studies (Schiefelbusch & Hollis, 1979), offers one alternative to producing such grammatically correct language behaviour, although there may be other ABA-based alternatives. For example, Relational Frame Theory (RFT) has been proposed as a means of both teaching grammar, and successfully generalizing these behaviours (McHugh & Reed, 2008), which argues that a hierarchical approach to teaching the structure of language to children with ASD will allow greater generalization (Rodgers, 2000). With this in mind, one final challenge remains to teaching grammar to children, and that involves teaching language when social stimuli (*private events*) are involved (Smith, 2003), helping to explain the difficulty they have learning grammar in naturalistic social settings.

The language of emotions is not often addressed in behaviour analytic literature (see Hayes & Wilson, 1993), although children who become increasingly more capable of using the language of emotions have been show to display improved social interactions skills, and to have more meaningful relationships with others (Fabes, Eisneberg, McCormick & Wilson, 1988; Howes, 1987; Parker & Gottman, 1989; Waters & Sroufe, 1983). Emotional competency has also been shown to predict academic success (Izard, Fine, Schultz, Mostow, Ackerman & Youngstorm, 2001), and leads to the development of improved social aptitude (Shields, Dickstein, Seifer, Guisti, Magee & Spritz, 2001). Without a basic understanding of the language of emotions, children with ASD struggle to develop the link between feeling and action (Hadwin, Baron-Cohen, Howlin & Hill, 1996), and the requisite ability to tact a set of emotions, identify emotions by situation, and infer their causes (Lemerise & Arsenio, 2000). Once these skill have been taught, it has been show to improve the ability of children with ASD to link action with emotion, (see Chapter

4), suggesting that it is possible to acquire the ability to tact *private events* based on shared understanding of what caused the emotional response.

In the first of two previous studies, a set of tacts for *private events*, were shown to function as conditioned reinforcers (see Chapter 2), while in the second study, spontaneous social language, to include a tact for a *private events*, was shown to be effectively prompted with visual support offered on an activity schedule (see Chapter 3). These studies offer some initial evidence that having access to sets of 'tacts for *private events*', could, under certain conditions, function as conditioned reinforcement when teaching non-preferred activities, and that independent social language can be effectively prompted with visual support in the context of an activity schedule. With the findings of this study, it has been shown that the *private events* can also feature in linguistically more complex utterances, where agreement between the subject, verb and comment (*private events*) were taught to children with ASD as part of a social language repertoire. The ability to generalize these skills suggests that there may be a generative quality to the ability to initiate conversations based upon a participant's ability to tact their emotions.

Future study clearly needs to be undertaken to address the validity of these findings, and to further extend the complexity of the grammar being taught. In particular, additional work needs to be conducted to define and validate the use tacts for *private events*, and to develop additional tactics for teaching children with ASD to observe and comment effectively, while improving linguistic skills and social interaction. Moreover, the present results should be interpreted in the context in which they were measured, and not as an indication that the linguistic skills and tacts for *private events* under investigation are a generative form of verbal behaviour, but instead as an indication that explicit teaching needs to address the deficits that children with ASD experience in developing social language. Although there were clearly ascending trends across all phases of instruction, and the corresponding generalization probes, it is important to remember that the environment in which these measures were taken were highly contingent and controlled ABA Home Programme sessions. One area of future research would be to use tests whether the tacts for *private events* taught in this study can be matched to the public correlates observed in others to tact their *private events*.

5. TEACHING CHILDREN WITH ASD TO TACT THE *PRIVATE EVENTS* OF OTHERS.

5.1 Introduction

An important, yet under investigated, extension of the *pure tact* is the tact for *private events*, which is usually described in terms of tacted stimuli that are sometimes only available to the speaker (Catania, 1988; Skinner, 1957). These tacts include being able to discuss one's own feelings and thoughts with others (e.g., *happy*, *sad*, *angry*), and are thought to be one of the greatest challenges that children with Autistic Spectrum Disorders (ASD) face when developing social language and behaviour (Volkmar & Klin, 1993).

Learning the language of emotions for typically developing children is a slow and gradual process (Halliday, 1993), and its difficulties are even more acute when applied to the social and emotional linguistic development of children with ASD (Greenspan & Wieder, 1998). Children with ASD have severe difficulty understanding emotion (Leslie & Frith, 1988), and such individuals often need targeted instruction to help them through the stages of learning to talk about such *private events*; for example, from naming a feeling, to expressing specific feelings in words (Greenspan & Wieder, 1998). Thus, example, when teaching children with ASD to tact *private events*, the relevant vocabulary based on shared correlates of *private events* needs to be taught, before a generative use for the tact for those *private events* can be applied.

The difficulty that children with ASD have in tacting emotions (e.g., labelling *happy*, *sad*, and *angry* faces) is exaggerated further when they are required to tact the *private events* of others (Hobson, Ouston & Lee, 1989). Children with ASD have been shown to be severely deficient when matching photographs, or drawn facial expressions, to the emotions that they are meant to represent (Hobson, 1986a), and they often struggle to understand the emotional responses of others, when compared with children who do not have ASD (Hobson, 1986b; Tantam, Monaghan, Nicholson & Stirling, 1989). An ability to tact the emotions of others is important, as understanding the emotions of others has been viewed as contributing to the development of social and emotional competence in young children (Bryant, 1987; Saarini, 2000; Sigman & Ruskin, 1999), while improving mental health and well being (Denham & Holt, 1993; Parker & Asher, 1987; Robins & Rutter, 1990), and providing a indicator of academic success (Raver & Knitzer, 2002).

Typically developing children of three to four years old have been shown to understand that emotions can be caused by particular situations (Borke, 1971; Trabasso, Stein & Johnson, 1981). However, this ability is not necessarily spontaneous, and their ability to tact these *private events* does seem to benefit from the tact for the targeted emotion being learned before matching it to a situation (Fabes, Eisenberg, McCormick & Wilson, 1991; Gnepp & Gould, 1985, Strayer, 1989). Moreover, children with ASD can show an ability to talk about their own emotions, and those of others (Tager-Flusberg, 1992), but they are limited by their lack of mastery of the *semantics* and *pragmatics* of the terms of emotional sates (Lohmann & Tomasello, 2003). Integrating these pieces of information, it is clear that, unless tacts for *private event*s are explicitly taught, shaped, and maintained, it is unlikely children with ASD will develop this form of verbal behaviour through casual day-to-day interactions.

A growing body research into the difficulties that children with ASD seem to have in understanding emotions, and what causes them has emerged (e.g., Atwood, Frith & Hermelin, 1988; Langdell, 1981; MacDonald, Rutter, Howlin, Rios, LeCouteur, Evered & Folstein, 1989; Ricks, 1979; Yirmiya, Kasari, Sigman & Mundy, 1989), while the language of emotions, particularly as it relates to "theory of mind" has also been scrutinised (e.g., Baron-Cohen, 2000; Hale & Tager-Flusberg, 2003). Such investigations have shown that improvements in language development, including vocabulary gain, have improved the ability of children with ASD to perspective take (Sparrevohn & Howie, 1995; Steel, Joseph & Tager-Flusberg, 2003) highlighting the importance, and collateral benefits, of teaching tacts for *private events* as part of social communication intervention. Thus, an effective teaching operation in the context of tacting the emotions of others is required, and continued efforts to shape and maintain these behaviours in those with ASD, in the context of social skills training, needs to be made.

The exploration of such an operation to teach children with ASD to tact the emotions of others is the main focus of this study. Although attempts to teach children with ASD emotional awareness, and to improve their understanding of the impact emotions can have on a social interaction has received a great deal of attention in curricula readily available for children with special needs, much of the evidence to support these interventions remains inconclusive and highly variable (Hagiwara & Myles, 1999; Norris & Dattilo, 1999). Social stories (Gray, 1994, 2000, 2006; Gray & Garand, 1993; Howley & Arnold, 2005), rating systems (Buron & Curtis, 2003; Jaffee & Gardner, 2006), speech and language approaches (Schroeder, 1996; Sonders, 2003), school-based peer modelling (Curry & Bromfield, 1994), mind mapping (Wycoff, 1991), and interactive therapy–based approaches (Attwood, 2004a, 2004b; Faherty, 2000), continue to provide accessible means to address instruction in emotional literacy for children with ASD, but by the nature of their designs are highly variable and difficult to measure their effectiveness.

In this study, children with ASD, who have been taught the relevant vocabulary to tact *private events*, were taught to label expression cards (e.g., *happy*, *sad*, *angry*), and then to tact these in response to a sets of 'situations' involving other children, thereby, tacting the *private event* of others. This period of instruction was, followed by two generalization probes, during which time the children were presented with novel situations, and were asked to tact the *private event* of another person in that situation, after which they were asked to name things that made them *happy*, *sad*, and *angry*, selected from a unique selection of situations. The first probe was designed to assess whether the ability to tact the *private events* of others, once shaped, could be easily generalized, while the aim of the second probe was to test whether a natural shift between the participants understanding of their own *private events* in situational context would be a relational outcome of their ability to analyze the environmental cues that allowed them to tact the *private events* of others.

5.2 Method

5.2.1 Participants

Ten children (8 male and 2 female), between the ages of 6.1 and 9.6 (mean age = 7.2 years) participated in this study. All of the children had been diagnosed by an independent paediatrician with childhood autism, and had Gilliam Autism Rating Scale (GARS) quotients of between 68 and 111 (see Table 5.1).

All the participants were receiving Home-Based ABA instruction (designed as a component programme of the CABAS® systems approach to education; Greer, 2002), which also included part-time placements in mainstream and special education schools. Students 1, 2, and 3 were in full-time special schools; Students 4, 5, 6, 7, and 8 were in school for a three-hour morning session; and Students 9 and 10 and attended a two-hour afternoon session.

Table 5.1: Descriptive statistics of selected variables for participants, including age, GARS scores & speaker skills.

Participant	Autistic Quotient	Percentile Rank	Probability/Severity	Speaker Skills
Student 1 - M (6.1 yrs)	70	2%	Below Average	PECS
Student 2 - M (6.3 yrs)	85	16%	Below Average	Vocal Verbal
Student 3 - M (7.0 yrs)	100	50%	Average	PECS
Student 4 - M (6.5yrs)	68	1%	Very Low	PECS
Student 5 - M (7.8 yrs)	80	9%	Below Average	Vocal Verbal
Student 6 - F (6.1 yrs)	93	32%	Average	Vocal Verbal
Student 7 - M (6.1 yrs)	111	77%	Above Average	Vocal Verbal
Student 8 - M (9.4 yrs)	110	75%	Above Average	Vocal Verbal
Student 9 - M (7.2 yrs)	85	16%	Below Average	Vocal Verbal
Student 10 - F (9.6 yrs)	110	75%	Above Average	Makaton

All of the children communicated through an augmented use of a picture symbol system, and had some Makaton Signs (manual sign), in their repertoires. Six of the children (Students 2, 5, 6, 7, 8, and 9) consistently and effectively used vocal verbal behaviour to *mand* and *tact*, two of the children (Students 1 and 3) were early speakers, and had some vocal verbal behaviour in their repertoires, while two children did not use vocal verbal behaviour to communicate, and had only a limited range of sounds and oral motor functions (Students 4 and 10).

None of the children would initiate an interaction with another child without prompting, and typically ignored the attempts of classmates and peers to engage them in even the simplest forms of interaction (e.g., eye contact). Spontaneous social language remained infrequent, and was limited to: greetings, "*thank you*", and "*please*", with occasional question asking. Participants were using multiple-word phrases, and had begun to respond in linguistically more complex utterances, which included agent/action/object phrases and conceptual language, as had been previously taught (e.g. colour, size, shape).

Prior to the current study, all of the children had been taught, through modelling and reinforcement (see Chapter 4) to construct increasingly more complex sentences, to include a subject, verb and tact for *private event* (e.g., "*connecting the puzzles was fun*", "*building with lego was boring*") after completed scheduled play activities, and using it to initiate a conversation with a language partner. None of the children had tacted other age-appropriate *private events* (e.g., "*I'm tired*", or "*I'm happy*").

5.2.2 Setting and Materials

The research was conducted in each of the participants' homes, and was designed to be fully integrated into their home-based ABA programmes. Typically, each room where the training was conducted contained a work table, and a set of chairs, programme materials, and a book case, on which toys and reinforcers were clearly displayed in transparent bins, labelled with picture symbols identifying what materials were contained in each box.

A set of laminated 2 x 2 inch cards, each with a drawing of a boys face for *happy*, *sad*, and *angry*, and corresponding situations for each, modified from the Black Sheep Press®, *Pragmatics 1: Emotions* (Rippon, 1992), were used during instruction (match-to-sample), and independent tacting phases. Sets included one card each of *happy*, *sad*, and *angry* emotions, and four situation cards for each expression: *Happy* situations included: "It's the boy's birthday", "The boy's friend have come to play", "Mummy bought the boy a puppy", and "He did well in school".

Sad situations included: "His friends won't let him play," "His sister is being horrible to him," "he fell and hurt himself," and "His balloon burst." *Angry* situations included: "Someone broke his pencils," "Someone drew on his drawing," "Someone walked on his sand castle," and "Someone ate all the sweeties."

5.2.3 Behaviour Definitions (Dependent Variables)

5.2.3.1 Match-to-Sample

In the teaching phase of the match-to-sample (B), correct responses were defined as correctly matching a face card (selected from *happy*, *sad*, and *angry*), to a line drawing illustrating situations for *happy*, *sad*, and *angry*. A full *verbal-gestural* and echoic prompt was offered during this phase, with situation cards on view in mixed order. To be scored correct, the participant was required to pick up the face card on offer, and place it on top of a situation card, following a gestural prompt, and an echoic, describing the expression and the situation (e.g., *put the happy face with boy at his birthday*, or *put sad face with the boy and his burst balloon*). The full echoic prompt was used to help condition the listener response to both the expression tact, and that of the situation, which would be required during the tacting phase.

During the independent phase (C), to be correct, the participant needed to independently place the face card on top of the situation card when given the antecedent "put same with same". Once the cards were matched, the teacher's response for correct matching was to reinforce the behaviour with a full echoic description of the match (e.g., *the boy is happy because it's his birthday*, or *the boy is sad because the balloon burst*, etc.). An incorrect response was defined as not matching-to-sample expressions with target situations correctly, or emitting an irrelevant behaviour.

5.2.3.2 Tacting the Private Events of Others

The tacting phase (D), which followed the match-to-sample instruction, was defined as tacting the *private event* of another person, in the presence of simple line drawing illustrations of *happy*, *sad*, and *angry* situations. After being pre-exposed to the *happy, sad*, and *angry* scenes, participants were shown scene cards individually, in a mixed order, and asked to tact the *private event* of the boy in each scene, responding to scene specific antecedents.

For *happy*, the antecedents included: "it's his birthday, how does he feel?, "his friends have come to play, how doe she feel?", "mummy has brought home a puppy, how does he feel?, and "he did well at school, how does he feel?". Sad antecedents included: "his friends won't let him play, how does he feel", "his sister is being horrible to him, how does he feel?", "he fell and hurt himself", and "his balloon burst, how does he feel?". For angry, antecedents included: "someone broke all of his pencils, how does he feel?", "someone drew all over his picture, how does he feel?", "someone walked on his sand castle, how does he feel?", and "someone ate all of the sweets, how does he feel?".

In order to be scored correct, participants were required to chose from the happy, sad and angry faces, and exchange them with their teacher in reply to the question asking (with verbalisation, or sign, as appropriate). An incorrect response was defined as presenting a face card that did not match the situation, offering an irrelevant response (e.g., a picture card that was not a facial expression), or emitting no response.

5.2.3.3 Generalization Probes

In the first of two generalization probes, a correct response was defined as tacting *happy*, *sad*, or *angry* in the presence of a line drawing of a situation not previously trained in the either match-to-sample, or the independent tacting, phases. Untrained sets of expression cards, including colour photos of children with *happy*, *sad*, or *angry* expressions were used during the probe. An incorrect response included those where target situations did not match the expression card exchanged, a non-expression picture was exchanged (e.g. mand or tact response), or no response was elicited from the participant.

In the second generalization probe, a correct response was scored when the participant selected one of the happy situations when asked: "what makes you *happy*?", a *sad* situation card, when asked: "what makes you *sad?*", and an *angry* situation card when asked: "what makes you *angry*?". Two unique situation cards for each of *happy*, *sad,* and *angry* were designed to for each participant, based on their past instructional history, and were not used in previous phases.

5.2.4 Experimental Design and Measurement

A multiple-baseline with full reversal, followed by a generalization probe, to assess the effectiveness of the procedure across novel settings, was used in this study. Data sheets were separated into columns, one each for correct responses, and incorrect responses. All measures were recorded as individual events. Each presentation was considered a Learn Unit (see Greer, 2002), defined as a three-term interlocking contingency between child and teacher, which included an antecedent, a behaviour, and a response for both the child and teacher.

5.2.5 Baseline (Tacting the *Private Event* of Others)

During the baseline phase, a measure of the participant's ability to initiate a "conversation", based upon a selection of "situation cards", was taken. Each situation card consisted of a simple line drawing, depicting something that could be described as making the boy illustrated feel *happy*, *sad*, or *angry*. During baseline, participants were required to exchange one of the expression cards (which was vocalized for children with vocal verbal skills) for *happy*, *sad*, and *angry*. Each correctly, and incorrectly, scored tact was recorded as a plus, or minus, in the appropriate column on the data sheet.

All participants were pre-exposed to the *happy*, *sad*, and *angry* faces before the baseline, in a point-to-sample task, during which two faces were show at a time, across all three expressions, with the antecedent: "point to *happy*, "point to *sad*", and "point to *angry*".

A teacher with a minimum of one year's experience teaching in ABA home programme ran the sessions, and by the participants parents, who had completed at least one year of a parent education programme. A senior Behaviour Analyst supervised all training, and teaching sessions. Sessions were conducted twice per day, five days per week.

5.2.6 Teaching (Prompted Match-to-Sample)

During the first teaching phase, a full *verbal* and *gestural* prompt was provided, during which line drawings of a *happy*, *sad*, and *angry* child were matched to corresponding situation cards for each expression. With three situations on view for each instructional trail, the participant was required to place the target expression card on top of the matching situation card. During this phase, a *gestual* prompt, guiding the expression card to the correct situation, along with the verbal instruction (e.g. "*put the happy face with the boy who is having his birthday*") was offered. A correct response required the subject to put *happy* with *happy*, *sad* with *sad*, and *angry* with *angry*. The teaching phase was maintained until three consecutive sessions at 100% correct was achieved.

5.2.7 Teaching (Independent Match-to-Sample)

During the Independent match-to-sample phase, the *verbal-gestural* prompt was faded, and the participants were now required to match expressions with the correct of three situations on display, without assistance. If the expression was correctly matched, the child was reinforced with verbal instructive praise (e.g., "*well done, the boy is happy because it's his birthday!*"). A count of correct responding was taken, based on the participant's response to put same-with-same antecedent. Unlike the previous phase when information about the expression and the situation were part of the antecedent, there was no intrinsic verbal prompt offered in the independent match-to-sample phase. This phase was maintained until three consecutive sessions at 100% correct was achieved.

5.2.8 Tacting *Private Events* of Others (Independent)

During the tacting phase, participants who had been pre-exposed to the facial expression, situations cards, and the appropriate language to tact the *private event* of another, during the two previous phases, were now taught the target response (tact for a *private event*) for each of the twelve situation cards previously trained in the match-to-sample phases. The form of the response in this phase was to exchange an expression card, in the presence of the illustration of each situation, following the verbal antecedent asking how the boy felt (e.g., "*it's his birthday, how does he feel?*"). During the tacting phase, a target situation card was presented, requiring the participant to identify it as *happy*, *sad* or *angry*, thereby exchanging one of the expression cards with the teacher in response. Correct responses where scored plus, while incorrect responses were corrected with the target response being given to the participant. The teaching phase was maintained until three consecutive sessions of 100% correct was achieved.

5.2.9 Return-to-Baseline

During the return-to-baseline, baseline conditions were maintained, and subjects were re-presented with the sets of four situations for each *happy*, *sad*, and *angry*. With the antecedent: "How does he feel?", a target response of happy, sad, or angry was again required in the form of an exchange of one of the expression cards with the teacher. The return-to-baseline was maintained until three consecutive sessions at 100% correct was achieved.

5.2.10 Generalization Probe (1)

During this probe, a set of untrained *happy*, *sad*, and *angry* situation cards were presented to the participants to test for generalization of any learning. Using the new sets of situation cards, four for each of *happy*, *sad*, and *angry*, participants were asked: "*how does he feel?*", in the presence of each card, requiring the exchange of the expression card for *happy*, *sad*, and *angry*, which were also untrained in previous phases. The presentation order was counterbalanced across participants, to control for sequencing effects.

5.2.11 Generalization Probe (2)

Participants were asked to tact what make them *happy*, *sad*, and *angry*, by exchanging situation cards, not taught in the previous phases, and which depicted scenes specific to each child, with distracter situation cards, that were irrelevant to either the child or the emotion, also made available. Participants were required to choose, from three situation cards on display, what made them *happy*, *sad*, or *angry*, and to exchange the card with their teacher. Following the exchange, verbal reinforcement, which included both the expression tact and the scenario tact (e.g. "*going to the park makes you happy!*"), was offered. As in the first probe, the presentation order in the second probe was also counterbalanced across participants.

5.2.12 Inter-Observer Agreement

Table 5.2: Inter-observer agreement across baseline, match-to-sample (prompted), match-to-sample (independent), tacting, and return-to-baseline phases, reported as Cohen Kappa.

Inter-observer Agreement: Instructional Phase

	Baseline (A)	Match-to-Sample (B)	Match-to-Sample Independent (C)	Tacting (D)	Return- to-Baseline (A)
Student 1	0.88	1.0	1.0	0.86	0.94
Student 2	1.0	1.0	0.94	0.88	1.0
Student 3	1.0	1.0	0.98	0.74	1.0
Student 4	0.96	0.98	1.0	0.79	0.82
Student 5	0.98	1.0	1.0	0.92	0.88
Student 6	1.0	1.0	1.0	0.98	1.0
Student 7	1.0	1.0	0.92	0.88	0.96
Student 8	1.0	0.96	0.98	0.66	1.0
Student 9	0.92	1.0	1.0	0.96	1.0
Student 10	0.96	1.0	1.0	1.0	0.94

Inter-observer agreement was calculated using Cohen's Kappa to control for chance agreements, calculated across 100% of the sessions for each of the children. The Cohen's Kappa for the Baseline (A) had a mean across participants of 0.97, and ranged from 0.88 to 1.0; for Teaching/ Match-to-Sample (B), the mean was 0.99, and the range was between 0.96 to 1.0; for Independent Match-to-Sample (C), the mean was 0.98, and the range was between 0.92 to 1.0; for Tacting (E), the mean was 0.88, and the range was between 0.66 and 1.0; for the Return-to-Baseline (A), the mean was 0.95, and the range was between 0.82 and 1.0.

Table 5.3: Inter-observer agreement across the generalization probes, reported as Cohen Kappa.

Inter-observer Agreement: Generalization Probes		
	Probe 1	Probe 2
Student 1	0.89	.094
Student 1	1.0	0.86
Student 3	0.76	0.90
Student 4	0.88	0.86
Student 5	0.84	0.92
Student 6	1.0	0.98
Student 7	0.78	0.86
Student 8	0.68	1.0
Student 9	0.92	0.87
Student 10	1.0	0.92

Agreement for the Generalization Probe 1 (*Untrained Situations*), across subjects during had a mean of 0.88, and ranged between 0.68 and 1.0; for Generalization Probe 2 (*Tacting Own Private events*), across subjects, the mean was 0.91, and ranged between 0.86 and 1.0. Thus, agreement was high for all participants in all phases of the study.

5.3 Results

Figure 5.1: Percent correct *happy*, *sad* and *angry*, across all phase, including match-to-sample, tacting and generalization for student 1.

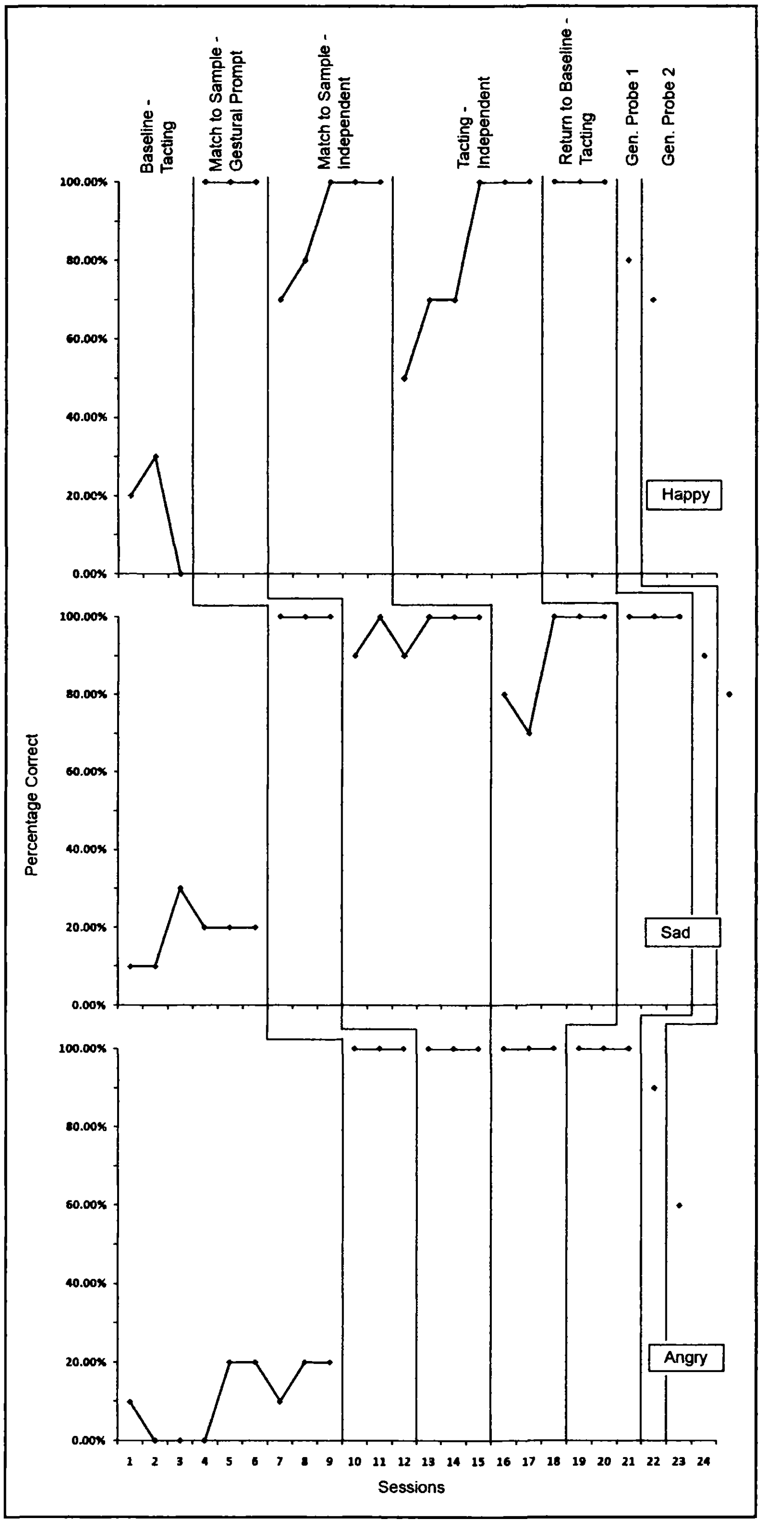


Figure 5.2: Percent correct *happy*, *sad* and *angry*, across all phase, including match-to-sample, tacting and generalization for student 2.

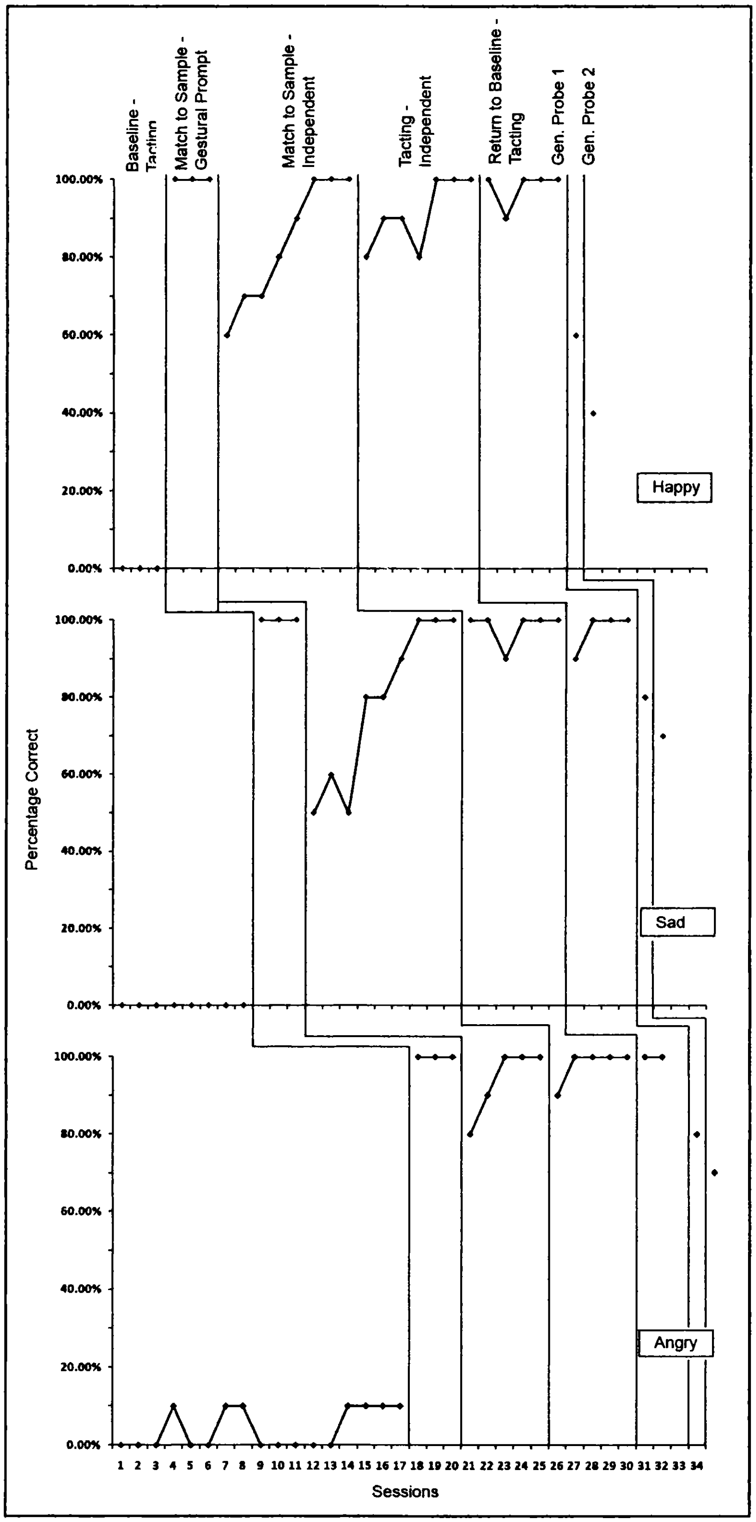


Figure 5.3: Percent correct *happy*, *sad* and *angry*, across all phase, including match-to-sample, tacting and generalization for student 3.

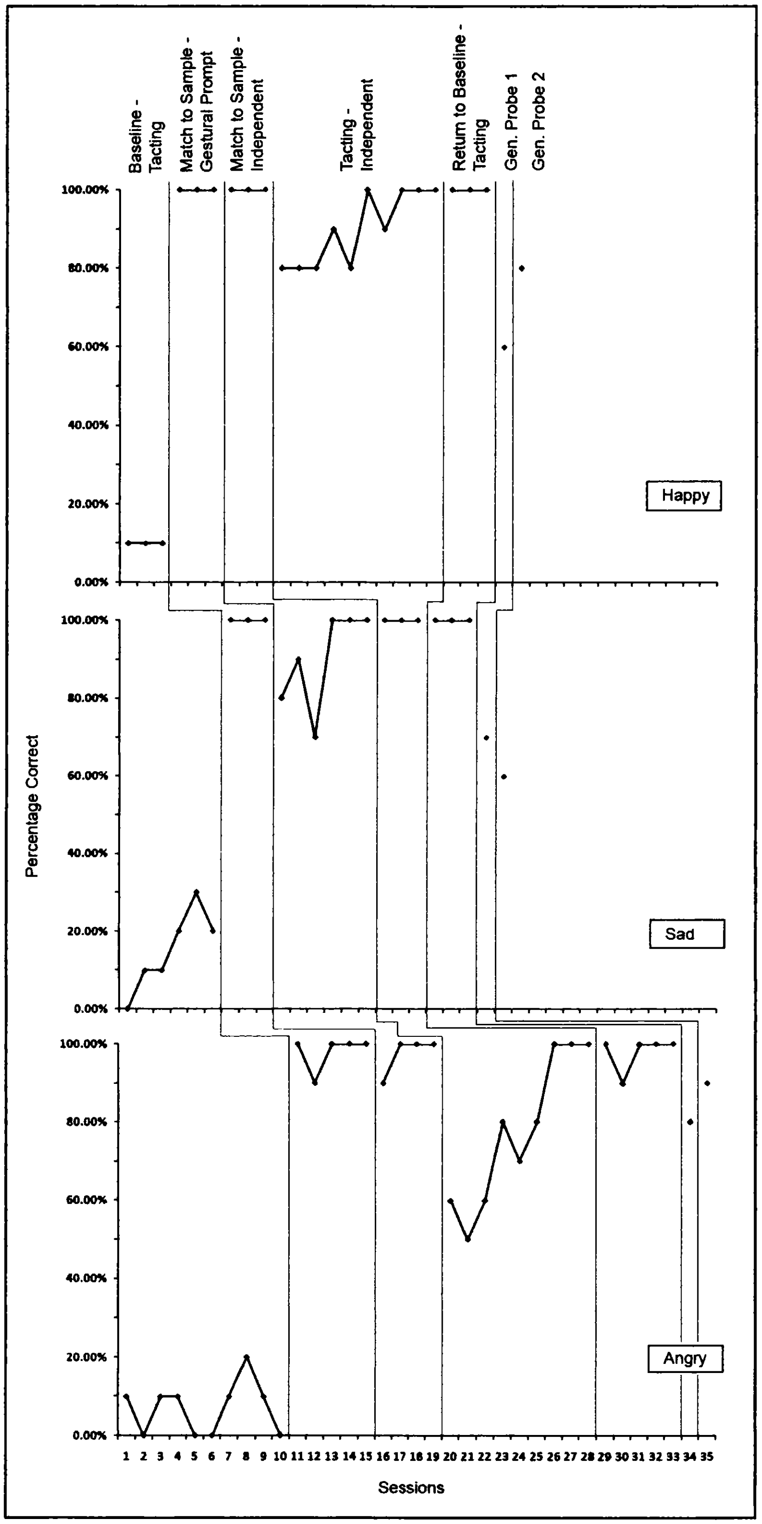


Figure 5.4: Percent correct *happy*, *sad* and *angry*, across all phase, including match-to-sample, tacting and generalization for student 4.

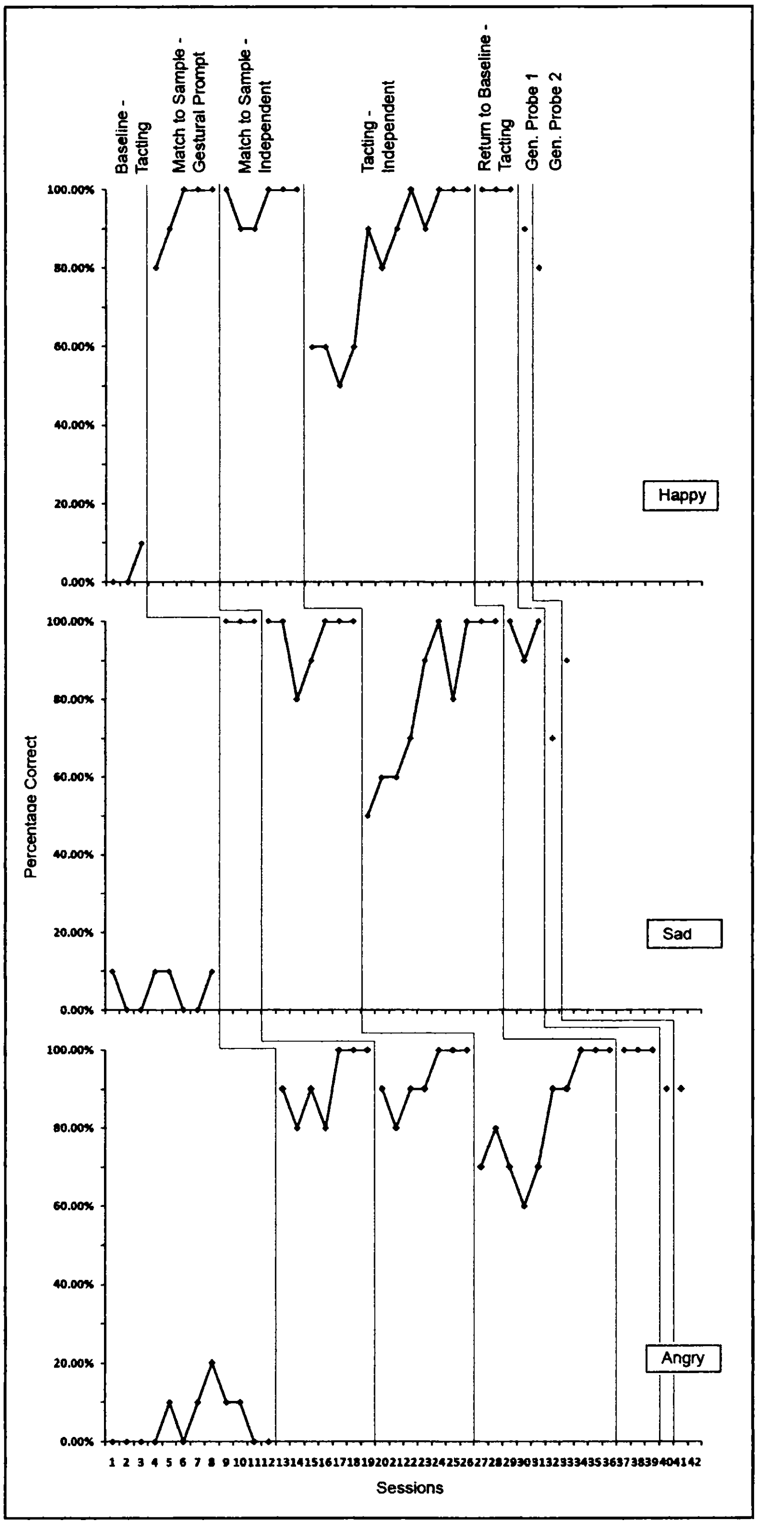


Figure 5.5: Percent correct *happy*, *sad* and *angry*, across all phase, including match-to-sample, tacting and generalization for student 5.

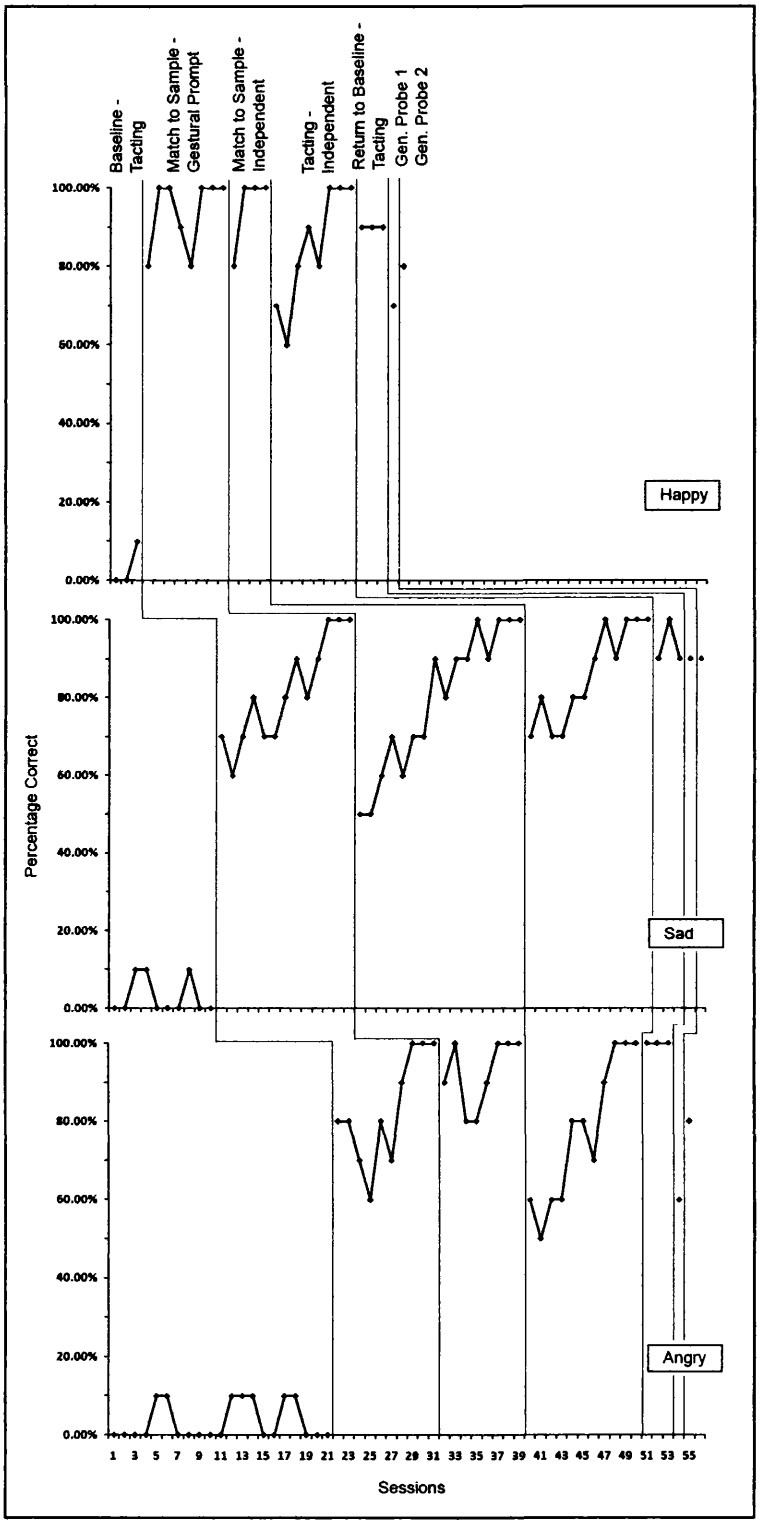


Figure 5.6: Percent correct *happy*, *sad* and *angry*, across all phase, including match-to-sample, tacting and generalization for student 6.

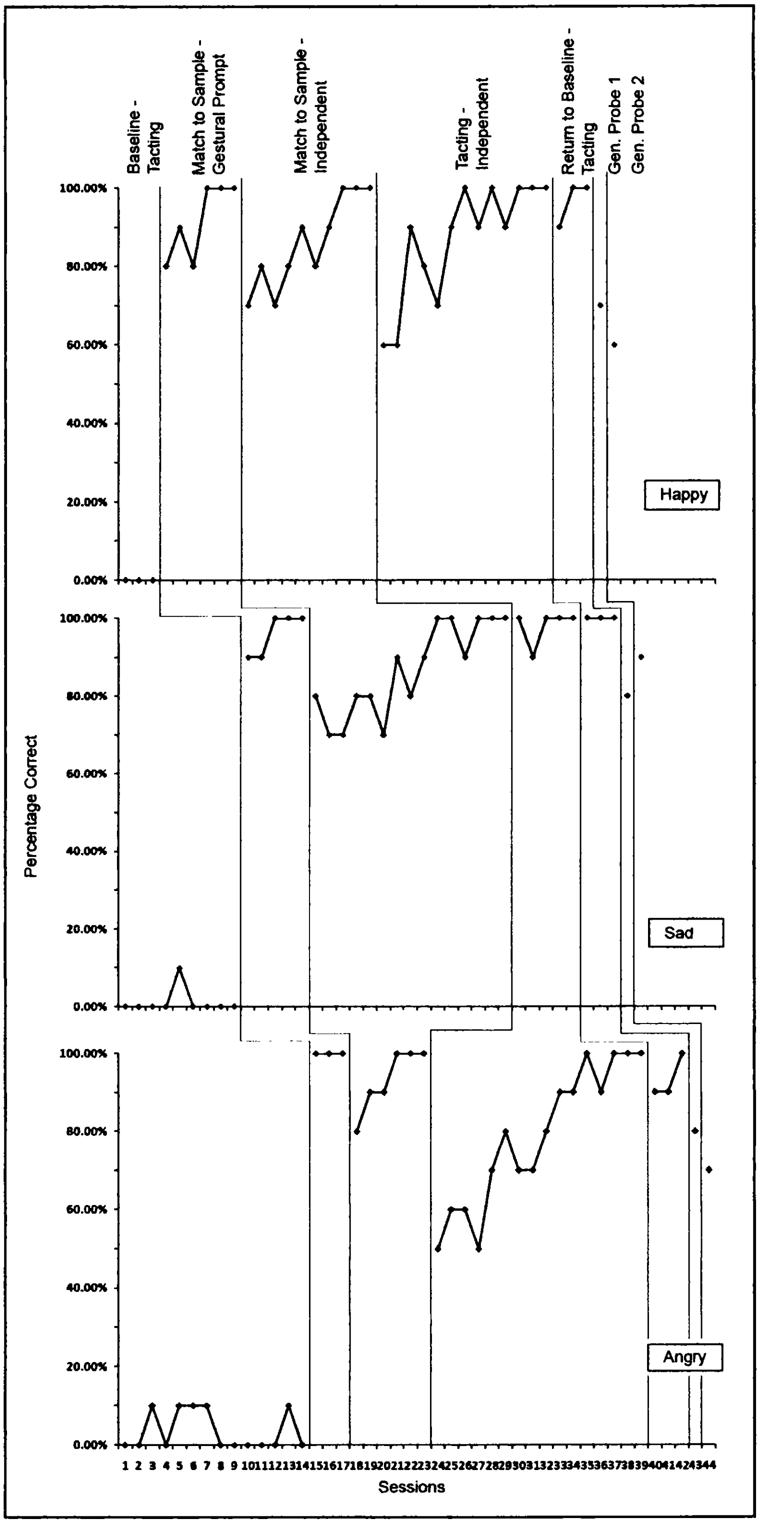


Figure 5.7: Percent correct *happy*, *sad* and *angry*, across all phase, including match-to-sample, tacting and generalization for student 7.

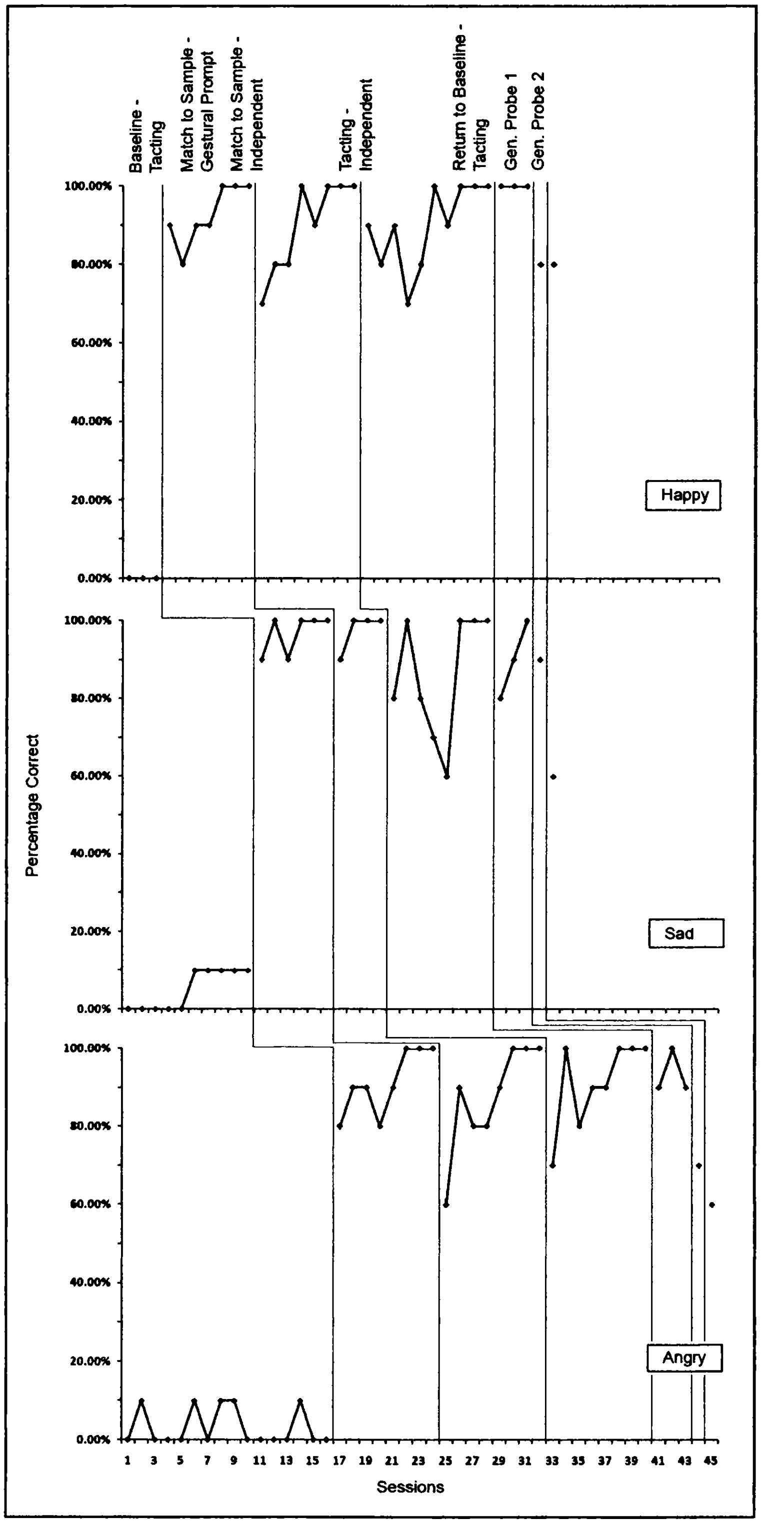


Figure 5.8: Percent correct *happy*, *sad* and *angry*, across all phase, including match-to-sample, tacting and generalization for student 8.

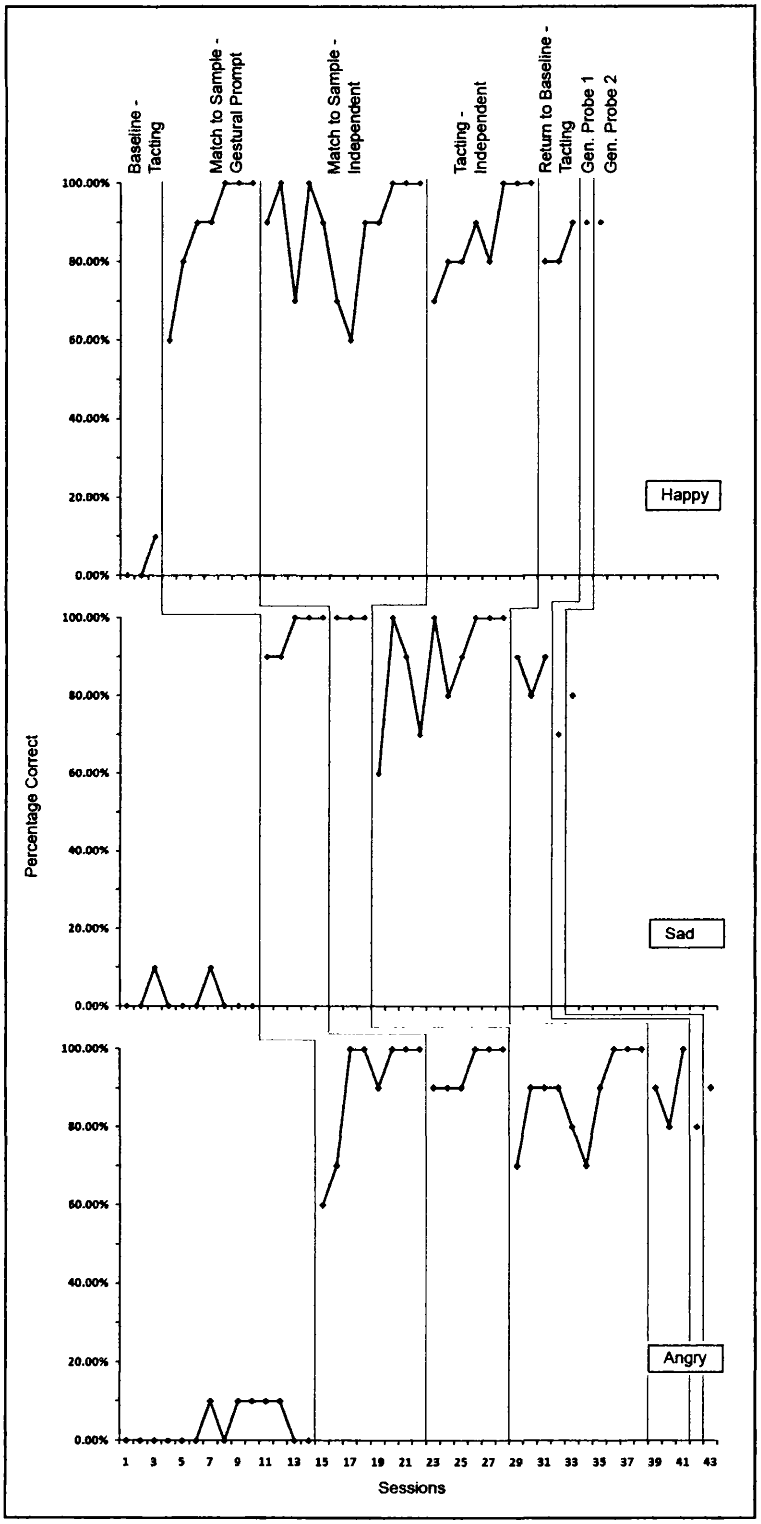


Figure 5.9: Percent correct *happy*, *sad* and *angry*, across all phase, including match-to-sample, tacting and generalization for student 9.

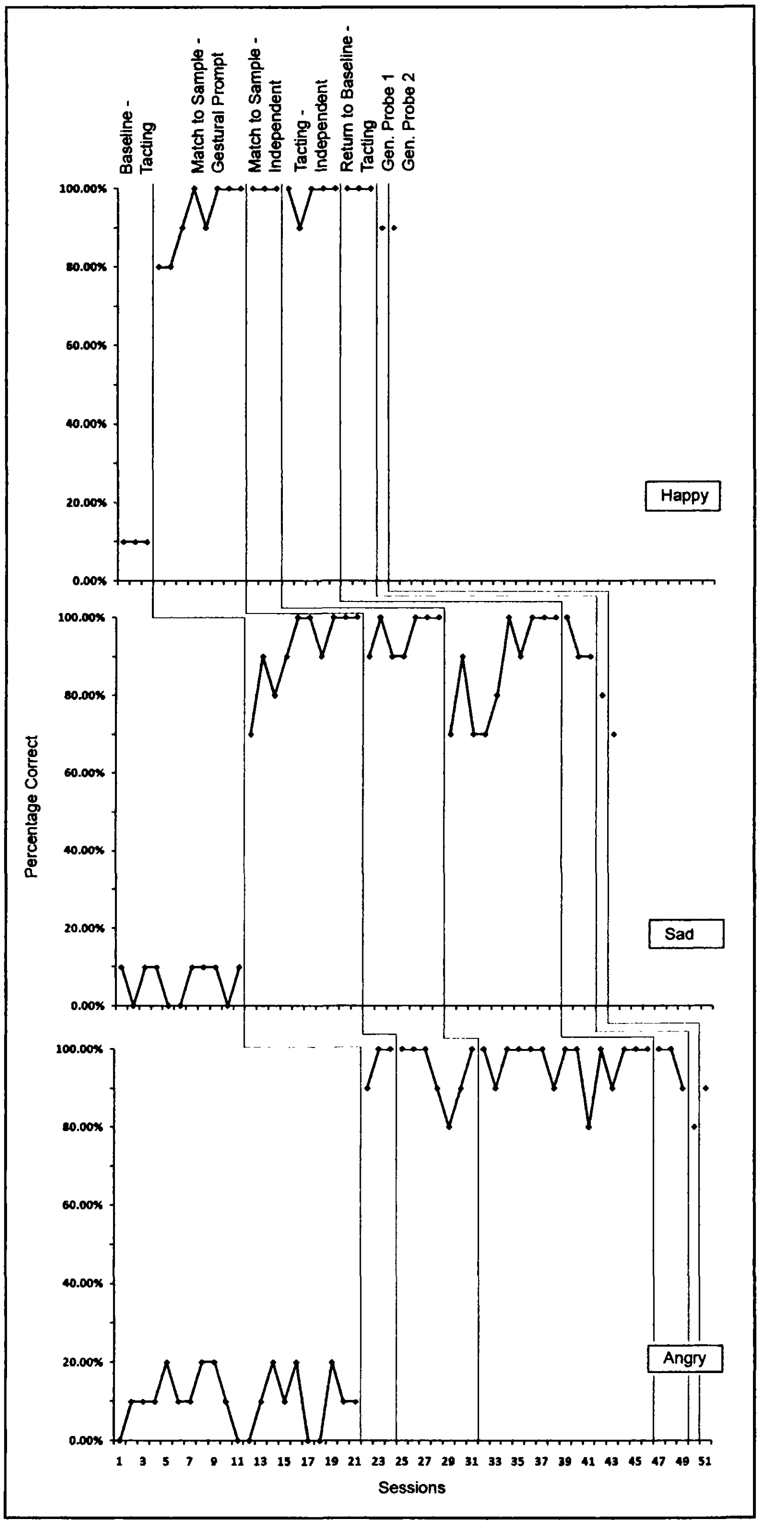
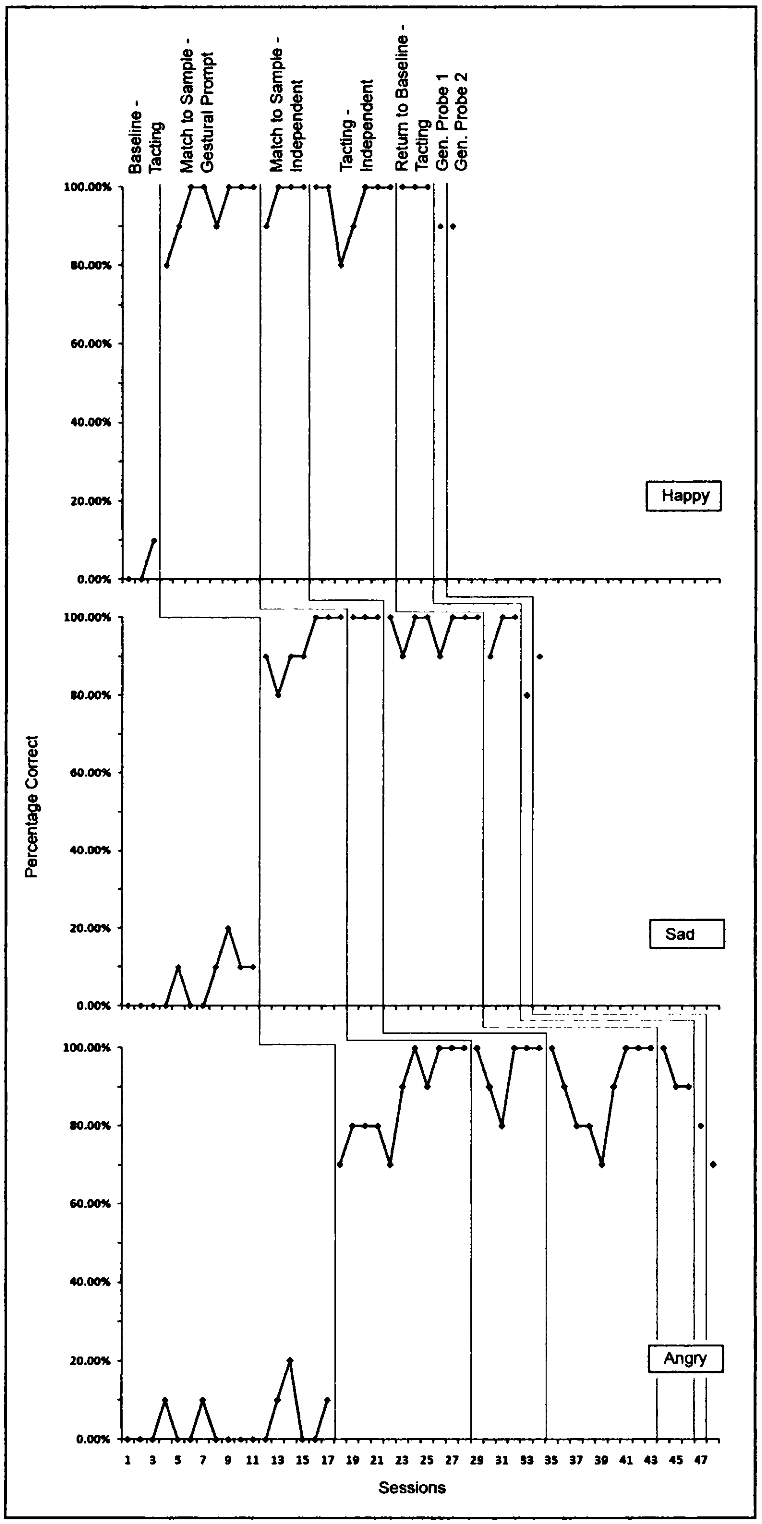


Figure 5.10: Percent correct *happy*, *sad* and *angry*, across all phase, including match-to-sample, tacting and generalization for student 10.



The results presented in Figures 5.1 to 5.10 show the total number of correct responses (shown as a percent correct), out of a possible 20 opportunities, for Baseline (A), Teaching/ Match-to-Sample (B), Independent/Match-to-Sample (C), Tacting (D), the Return-to-Baseline (A), and two Generalization Probes (1 & 2). Overall, the results show that: (a) the introduction of the Match-to-Sample phase designed to teach tacts for *private events*, and their associated situations, did condition children with ASD to the language of emotions, (b) an ability to tact the *private events* of others, as represented in each of the scenario cards, improved as a result of the training, and (c) that this tacting skills could be generalized to novel situations, across the same emotion expressions, while it also assisted children to associate tacts for *private events* to their own emotional response to situations.

The tacts for *private events*, which were targeted for teaching in this study, were successfully conditioned across participants, and applied to the public correlates of the behaviour of others. During the Baseline phase, a range of between 0% to 30% across participants, with a *M*= 17% correct, was observed. This relatively low score compares poorly to the correct responses seen during teaching in the Teaching/ Match-to-Sample phase (*M*= 94% correct, with a range of between 60-100% correct), and in the Independent/Match-to-Sample phase (*M*=91% correct, with a range of between 50-100% correct), phases, during which the correct response achieved criteria, and was independently maintained for three sessions each, across participants.

During the Tacting phase correct responding decreased when compared to the match with sample phases (*M* = 88%, with a range of between 50-100% correct), but it nevertheless was maintained for three consecutive sessions of 100% of independent responding before returning to the baseline conditions. During the

Return-to-Baseline phase, the participants ability to tact the *private event*s of others were successfully maintained for five consecutive sessions (M = 96%, with a range of between 50-100% correct).

The two generalization probes that followed the full reversal, tested the participants' ability to tact untrained scene cards (Probe 1), and to tact their own *private event*s, by identifying those scenes that made them *happy*, *sad*, or *angry*, from sets of individualised scene card. During the first probe, a range of 60%-90% (M = 71%) correct responding was recorded across participants. There appeared to be no great differences between correct responses for *happy* (M=78%), *sad* (M=80%), and *angry* (M=79%), as all were higher than the group of scenes measured in baseline (A). The second probe, to determine whether participants could tact scenes that made them *happy*, *sad* or *angry*, resulted in a range of 40-90% correct, with a mean of 77% correct. As in the first probe, there was no significant difference between happy (M=76%), sad (M=78%), and angry (M=77%).

5.4 Discussion

This study investigated whether, or not, it was possible teach children with ASD to tact the *private events* of others. A measure of generalization across untrained situations was also taken, followed by an opportunity to tact those things that made the participants *happy*, *sad* and *angry*. This study suggested that children with ASD can acquire the language of emotional expression, and the ability to tact the *private events* of others, following a match-to-sample task with a range of target emotions and situations.

The findings of this study suggest that in a controlled setting, and following targeted instruction, children with ASD were able to tact the facial expressions for *happy*, *sad*, and *angry*, and attach these tacts to the situational cues offered in a series of contrived scenarios. The data from all children in this study showed that tacts for *private events*, and an ability to tact the *private events* of others, increased during instruction, and was then maintained in both the return-to-baseline, and generalization, phases. Equally, it was shown that the participants could extend this skill when asked to tact what makes them *happy*, *sad*, or *angry*, when shown novel sets of situations, not used during the previous phases.

These data suggest that children with ASD can be taught the language of emotions, and develop a basic understanding of the emotional states of others. This study supports the suggestion that children with ASD can differentiate between emotions (Sigman & Ruskin, 1999), although they often require more time and prompts, with tentative and scripted responses to the emotions of others resulting (Capps, Yirmiya & Sigman, 1992). It should also be noted that, although children with ASD are able to learn tacts for emotions (*private events*), they often struggle applying them to situations, where false beliefs and desires are attached (Grant, Grayson, & Boucher, 2001), and often use idiosyncratic and unconventional means to communicate their understandings (Prizant & Wetherby, 1987).

A number of issues, of course, will require further investigation. The current results do not imply that an understanding of what causes emotion, has been learned by the children with ASD. Instead it offers some evidence there is a capacity to learn tacts for *private events*, and systematically apply these tacts to learned and untrained situations. This evidence supports the suggestion that it may not be the inability to understand that there is a link between emotion and situation (Baron-Cohen, 1991), but instead that there is a cognitive or affective deficit, which precludes children with ASD from distinguishing between belief and desire (Hobson, 1986a, 1986b, 1990;

Leslie & Frith, 1988). Thus, the affect of others is actively suppressed by children with ASD, perhaps due to an aversion to interpersonal contact (Corona, Dissanayake, Arbelle, Wellington & Sigman, 1998; Sigman, Kasari, Kwon & Yirmiya, 1992), difficulty conceiving of inter-subjectivity on an emotional level (Hobson, 1993, 1994), or because it requires learning about multiple cues which children with ASD find difficult (Lovaas, 1981).

Studies have been conducted to assess whether children with ASD understand what causes emotion, or whether they have a meta-representational deficit (Baron-Cohen, 1991; Leslie, 1987, 1988). It has since been suggested that perhaps children with ASD learn the conventions governing which situations give rise to different emotions, in a way that is similar to that in typical development (Wellman & Woolley, 1990), and that their failure is not in decoupling, but instead in referencing and distinguishing misrepresentation (Pylyshyn, 1978). This may explain the finding that children with ASD give correct answers in "photographic tasks", where the a photographic representation does not conform with the outside world, as they have learned through experience that the situations in photographs tend to be fixed and unchangeable, rather than as a representation of the external scene (Leekman & Perner, 1991).

The findings in the present study tested the ability of children with ASD to tact the *private events* of others, based of situations where representation matched expectation, offering additional evidence that learning governing convention is possible, whereas their ability to successfully generalize this skill to untrained stimuli provide some insight into their ability to transfer referencing information, imbedded in the unfamiliar situations.

The participants in this study had previously been taught a set of tacts for *private events* (*fun, boring, liked, & don't like*), that were shown to function as conditioned reinforcers (see Chapter 2), and to initiate a conversational unit, to include a tact for a *private event*, when prompted with a visual "talk" card on their activity schedules (see Chapter 3). In the third of these studies, increasingly more complex language, where agreement between the subject, verb and comment (*private event*), was successfully taught to children with autism, further enriching their social language repertoire (see Chapter 4). These studies offer some initial evidence that having access to sets of tacts for *private events*, can function as a conditioned reinforcer, be effectively prompted with visual support in the context of an activity schedule, and provide a tool for teaching more advanced linguistic skills to children with autism.

With this study, it has been suggested that as these skills develop in sequence, an understanding of the language of emotions can be generalized to tact the public correlates of the behaviour of others. When compared to a No-Contact Control Group, targeted instruction in the language of *private events* may also lead to an advantage in being able to respond to a *private event*, with better general outcomes on language *semantic* and *pragmatic* language scales and than children who did not participate in this instruction.

It is often thought that "privileged access" or "special knowledge" of the *private events* is needed in order to effectively teach the language of emotions (Catania, 1988). Instead, what may be learned are the relevant words for these tacts from others, who only had access to the public correlates to the events when they were teaching these tacts (Catania, 1988). It is because of this, when teaching children with ASD to tact *private events*, that the relevant vocabulary, based on these shared correlates, needs to be taught, before a generative use for that tact can be applied (McHugh, Barnes-Holmes & Barnes-Holmes, 2004). Due to inconsistent access to the *private events* and their public correlates, it is often difficult to shape and maintain the language of emotions, although Catania (1998) argues that the relation between *tacting* a *public event* and *tacting* a *private event* is similar to the relation between tacting when both speaker and listener have access to what has been tacted, and tacting to which only the speaker has access. These difficulties, both theoretical and developmental, are ever more acute when applied to the social, emotional language development of children with ASD (Howlin, 1986), and yet it remains important to begin exploring the language of emotions, in order to improve emotional literacy, which may also be a predicator of social and academic success (Robins & Rutter, 1990).

It may also be argued that joint attention skills, which are often deficit in children with ASD, are in part maintained by the establishment of new stimuli (e.g. tacts for *private events*) as conditioned reinforcement over the course of a learning history (Dube, MacDonald, Mansfield, Holcomb & Ahearn, 2004), and may therefore be improved through mediation. This may also lead to additional opportunities to better understand the socially derived meaning of emotion, which is often linked to observations of facial cues and body language, when emotion is put into context (Alvarado, 1996). The socially derived meaning of emotion would suggest that there is a shared interpretation of the tacts for *private events*, with congruence between expression and tacts (Ekman & Friesen, 1978; 1982).

Additional work needs to be conducted to define and validate the use tacts for *private event*s, and to develop additional tactics for teaching children with ASD to tact the *private events* of others, with greater understanding and meaning. Future study also needs to be undertaken to extend the range of emotion tacts beyond *happy*, *sad* and *angry*, while assessing the impact of instruction on joint attention and the development of the meaning of emotion for children with ASD.

The present results should be interpreted in the context in which they were measured, and not as an indication that the participants have learned a generative understanding of *private event*s of others under investigation, but instead as an indication that explicit teaching needs to address the deficits that children with ASD experience in understanding the emotions of others. Although there were clearly ascending trends across all phases of instruction, and the corresponding generalization probes, it is important to remember that the environment in which these measures were taken were highly contingent and controlled ABA Home Programme sessions. One area of future research would be to test whether the tacts for *private events* of others taught in this study could be generalized to naturalistic settings, where the emotional states of others will be greater in quantity and variety, and more transient in nature (Fabes, Eisneberg, McCormack & Wilson, 1988).

6 TACTING CHANGES IN EMOTIONS: CAN CHILDREN WITH ASD IDENTIFY A CHANGE IN THE EMOTONAL STATE OF OTHERS?

6.1 Introduction

The ability to recognise the *private events* of others, by responding to the display of the public correlates of that event (e.g., facial expressions, body language, or situational information), plays a vital role in maintaining our social and emotional communication skills. For example, this ability helps individuals to regulate conversation and interpersonal involvement (Nelson, 2001; Schultz, Gauther, Klin, Fulbright, Anderson, Volkmar, Skudarski, Lacadic Cohen, & Gore, 2000). Failing to accurately label (tact) these *private events* from the visual clues available, could result in social awkwardness, or isolation, an inability that is particularly problematic for children with Autistic Spectrum Disorders (ASD; Dawson, Troth, Abbot, Osterling, Munsen, Estes & Liaw, 2005).

In fact, some researchers believe that a lack of ability to understand the public correlates of a *private event*, for instance, partially expressed through facial expression, could be central to the social difficulties experienced by individuals with ASD (e.g., Grelottii, Gauthier & Schultz, 2002). This suggestion arises from a number of studies exploring mental state recognition in both adults and children with ASD (Baron-Cohen, Jolliffe, Mortimore & Robertson, 1997; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001; Baron-Cohen, Wheelwright, and Jolliffe, 1997). Whether this explanation ultimately proves to be correct, or not, it is certainly the case that deficits in interpersonal skills form a core characteristic of individuals with ASD (DMS IV).

This deficit may be due, in part, to limited joint attention skills (Rieffe, Terwogt & Stockman, 2006). Children with ASD have been show to have significant difficulty maintaining joint attention, and especially in attending to the expressions of emotion displayed in the eye region (Baron-Cohen, Wheelwright, Spong, Scahill, & Lawson, 2001b), leading some researchers to suggest that they may actively avoid eye contact (Buitelaar, 1995; Graham, 2005; Volkmar & Mayes, 1990). In contrast, children with ASD have been shown to have greater success in tacting the emotions (*private events*) of others, when additional situational information is made available (Klin, Jones, Schultz, Volkmar & Cohen, 2002), and when their attention was drawn to the lower face (Joseph & Tanaka, 2003; Langdell, 1978). These findings underline some of the difficulties, and the complexities, children with ASD face when trying to understand the *private events* of others.

Many early studies of the ability of people with ASD to recognise emotions relied on *static* stimuli (e.g., photographs and line drawings; Bormann-Kishkel, Vilsmeir & Baude, 1995; Boucher, & Lewis, 1992; Ekman & Friesen, 1978; Hobson, 1986a, 1986b), whereas it is now thought that video images (*dynamic stimuli*) may give a more accurate measure of whether children with ASD recognise emotion (Gepner, Deruelle & Grynfeltt, 2001; Joseph & Tanaka, 2003; Klin, Jones, Shultz, Volkmar & Cohen, 2002; Langdell, 1978), as this *dynamic* stimuli bares a greater similarity to the cues experienced in everyday life (Moore, 2001; Moore, Hobson & Lee, 1997); whereas *static* stimuli could underestimate a person's ability to recognise emotions (Moore, 2001). Studies with typically developing populations have found a better performance with *dynamic* than with *static* faces in tacting identity recognition (e.g., Knight & Johnston, 1997; Lander & Bruce, 2000, 2003; Lander & Chuang, 2005), and in emotion recognition (Harwood, Hall & Shinkfield, 1999; Wehrle, Kaiser, Schmidt & Scherer, 2000); the *dynamic* stimuli may offer additional information that may facilitate recognition (such as temporal) that is absent in photographs.

Only one study has directly explored recognition of emotions from *dynamic* facial stimuli in children with ASD (Gepner, et. al., 2001), where they were shown to perform similarly to control groups in recognising basic mental states, when presented both *statically* and *dynamically*. This ability to recognise emotions from *dynamic* situations may, in part, be due to the ability of children with ASD to respond relationally, transferring their surprisingly good skills in tacting *static* stimuli to *dynamic* stimuli, thereby offering illustration of a *behavioural cusp* (Greer & Koehane, 2008; McHugh, 2008; Rosales-Ruiz & Baer, 1996). A *Behavioural Cusp* can be thought of as behaviour, such as tacting the *static* stimuli of emotions, which, because it has occurred, allows new behaviours to be learned (e.g., tacting *dynamic* stimuli). The importance of the *cusp* is it often accomplishes: "*extensive or important collateral behaviour change because they increase the organism's exposure to the relevant teaching contingencies*" (Rosales-Ruiz & Baer, 1997, p. 537). Whatever the explanation of the ability of children with ASD to recognise *dynamic* emotions, it remains difficult to teach children with ASD to tact emotions (*private events*), a challenge which is amplified when conditioning these tacts in *dynamic* situations, which would then provide a more functionally useful skill for the behaviour.

In the present study, children with ASD, who had previously been taught the relevant vocabulary to tact *private events*, were first taught to label *static* expression cards (e.g., *happy*, *sad*, *angry*). Following this phase, they were taught to tact responses to a sets of 'situations' involving other children, thereby, tacting the *private event* of others. In the final phase of the study, the participants were taught to tact changes in emotional expression in both *static* and *dynamic* stimuli without situational information to draw upon. The sequential instruction across *static* and *dynamic* stimuli was followed by a generalization probe, during which the children were presented with untrained videos (*dynamic*), and were asked to tact the change in *private event* from onset to ending. The probe was designed to assess whether the ability to tact the recognition of a change in *private events* could be easily generalized. This progression may offer support fort a *behavioural cusp*, in that each newly taught and learned behaviour is thought to allow additional socially valid behaviours to be acquired (Bosch & Fuqa, 2001). The behavioural cusp argument provides support for the suggestion that small, sequential steps lead to increasingly more complex skills, but that the new skills alone don't necessarily result in new contingencies, but instead allows them to open up onto the next skill (Rosales-Ruiz & Baer, 1997), facilitating performance on previously difficult to learn skills.

6. 2 Method

6.2.1 Participants

Ten children (8 male and 2 female), between the ages of 6.4 and 9.9 ($M = 7.5$ years) participated in this study. All of the children had been diagnosed by an independent paediatrician with childhood autism, and had Gilliam Autism Rating Scale (GARS) quotients of between 68 and 111 (see Table 6.1).

All participants were receiving home-based ABA instruction (designed as a component programme of the CABAS® systems approach to education; see Greer, 2002), which also included part-time placements in mainstream and special education schools. Students 1, 2, and 3 were in full time special schools; Students 4, 5, 6, 7, and 8 were in school for a three-hour morning session; and Students 9 and 10 attended a two-hour afternoon session. All of the children communicated through an augmented use of a picture symbol system (PECS®), and had some Makaton Signs® (manual sign), in their repertoires. Eight of the children (Students 1, 2, 3, 5, 6, 7, 8,

& 9) used vocal verbal behaviour to mand and tact, as well as respond to intra-verbals and social initiations. Two participants (Students 4 & 10) did not use vocal verbal behaviour to communicate, but instead had a well developed use of PECS®, which were occasioned by a limited range of sounds.

Table 6.1: Descriptive statistics of selected variables for participants, including age, GARS scores & speaker skills.

Participant	Autistic Quotient	Percentile Rank	Probability/Severity	Speaker Skills
Student 1 - M (6.4 yrs)	70	2%	Below Average	PECS
Student 2 - M (6.6 yrs)	85	16%	Below Average	Vocal Verbal
Student 3 - M (7.3 yrs)	100	50%	Average	PECS
Student 4 - M (6.8yrs)	68	1%	Very Low	PECS
Student 5 - M (8.2 yrs)	80	9%	Below Average	Vocal Verbal
Student 6 - F (6.4 yrs)	93	32%	Average	Vocal Verbal
Student 7 - M (6.4 yrs)	111	77%	Above Average	Vocal Verbal
Student 8 - M (9.8 yrs)	110	75%	Above Average	Vocal Verbal
Student 9 - M (7.5 yrs)	85	16%	Below Average	Vocal Verbal
Student 10 - F (9.9 yrs)	110	75%	Above Average	Makaton

All ten participants had been taught to tact *fun, boring, easy, hard, like,* and *didn't like* in three previous studies (see Chapter 2, 3 & 4), and to tact *happy, sad,* and *angry* (see Chapter 5), as well as to use *yes* and *no* to confirm their response, when internal validity was tested (see Chapter 3, 4 & 5). These children had also been taught to follow a visual schedule and to respond to a *talk* prompt, by initiating a conversational unit with a language partner, commenting on a play activity after completion (see Chapter 3 & 4).

6.2.2 Setting and Materials

The research was conducted in each of the participants' homes, and was designed to be fully integrated into their Home-Based ABA Programmes. Typically, each room where the training was conducted contained a work table, and a set of chairs, programme materials, and a book case, on which toys, and reinforcers, were clearly displayed in transparent bins, labelled with picture symbols identifying what materials were contained in each box. A computer or TV was available made available, either in the instructional room, or in another room in the house for the duration of this study.

Photo cards measuring 21 x 15 cms, for *happy*, *sad* and *angry* (two male and two female faces for each expression) were used to tact the change in expression during the *static* phase ("Teaching B" & "Independent Tacting C"). These cards were colour photos, mounted on heavy card, and showed and framed the model's head and shoulder in its border. Meyer-Johnson® symbol cards were available for *happy*, *sad* and *angry*, and a sequence board, with empty squares separated by the word "then", was used to provide a point of reference for the participant during tacting (in both *static* an *dynamic* phases).

The facial expressions during the *dynamic* phase ("Teaching D" & "Independent Tacting E") were provided by two male, and two female faces for each expression change set, and were recorded on a DVD. Close-ups of each model's face were shown in front of a neutral back ground, wearing plain white t-shirts, to reduce contextual cues and visual distraction. The models were in their mid-twenties, and were unfamiliar to the participants. The length of each set varied between eight and ten seconds, with the duration in the apex of each expression averaging 3 seconds. The models were directed to clearly express *happy*, *sad*, and *angry* with full use of their eyes and mouths. A growing body of evidence suggests that in similar emotion recognition tasks, typically developing adults and children are able to recognize these changes without the addition of situational information (Bassili, 1978; Ekman, 1994; Izard, 1994; Massaro, 1998) but often perform better in *dynamic* vs. *static* conditions (Kamachi, Bruce, Mukaida, Gyoba, Yoshikawa & Akamatsu, 2001; Kätsyri & Sams, 2008).

The videos were shown on either a computer screen or TV, and varied with each home programme setting. Symbol cards were available for *happy*, *sad* and *angry* and a sequence board, with empty squares separated by the word "then", was used to provide a point of reference for the participant during tacting

6.2.3 Behaviour Definitions (Dependent Variables)

6.2.3.1 Tacting Changes in Emotions (from Photo Cards)

During the Teaching phase (B), and the Independent Tacting phase (C), in the *static* condition, a correct response was defined as correctly identifying the *private events* in order, both by placing the corresponding symbol card on the sequence board, and by verbalizing the *private events* in sequence. Responses were based on the presentation of two expression cards placed side by side by the participant (e.g., the sequence *happy* then *sad* required the tact of "*happy then sad*", and the placement of the symbols for *happy* and *sad*, in that order, on the sequence board, thereby tacting the change in *private event*.

6.2.3.2 Tacting Changes in Emotions (from Video images)

During the Teaching phase (B), and the Independent Tacting phase (C), in the *dynamic* condition, a correct response was defined as correctly identifying the *private events* in order, both by placing the corresponding symbol card on the sequence board, and by verbalizing the *private events* in sequence. Responses were based on the presentation of a short video clip (eight to ten seconds long) of a model changing expression (e.g. from *happy* to *sad*), requiring the tact of "*happy then sad*", and the placement of the symbols for *happy* and *sad* to be placed in that order on the sequence board, thereby tacting the change in *private event*.

6.2.3.3 Generalization Probes

Following a return-to-baseline, a generalization probe was conducted to determine whether the children could tact the changes in expression across untrained video clips. The videos during generalization were of new models, two for each pair of expression change, for a total of twelve new sets, across *happy*, *sad* and *angry*. Responses were scored correct if the participants could tact *happy* then *sad*, *sad* then *happy*, *happy* then *angry*, *angry* then *happy*, and *sad* then *angry*, following each video presentation, and the presentation of the antecedent: "How did they feel?", while also placing the corresponding symbols for *happy*, *sad* and *angry* on the sequence board.

6.2.4 Experimental Design and Measurement

A multiple baseline (ABCDEA) across participants, with a full reversal, followed by a generalization probe (F), to assess the effectiveness of a procedure to improve the ability of children with ASD to tact changes in the expression of emotion in both *static* and *dynamic* conditions was used in this study.

Data sheets were separated into two columns, one each for correct initiations and incorrect responses across phases. All measures were recorded as individual events. Each unit of measure (tact of *private event*) was considered a *Learn Unit* (see Greer, 2002), defined as a three-term interlocking contingency between child and teacher, which included an antecedent, a behaviour, and a response for both the child and teacher.

6.2.5 Baseline (Tacting Changes in the Emotions of Others)

During the baseline phase, participants were shown a short video clip (*dynamic* presentation) of a model's face changing their expression across the target emotions (*happy* then *sad, sad* then *happy*, *happy* then *angry*, *angry* then *happy*, *sad* then *angry*, and *angry* then *sad)*. The order of presentation was counterbalanced across participants across all phases. Participants were asked: "How did they feel?" following the presentation, and they were required to tact the emotions in the order in which they were seen. In addition they were required to place the symbols for each of the emotions onto a symbol sequencing board, which was placed in front of the video screen, on which participant were expected to place the symbols in the order they were seen. No prompting, gestural or echoic, was offered during baseline.

6.2.6 Teaching/Tacting (from Photo Cards)

During the Teaching/Tacting Phase (*static* condition), photo cards of the target emotions were paired in teaching sets, and included: Set 1: *happy* and *sad*; Set 2: *sad* and *happy*; Set 3: *happy* and *angry*; Set 4: *angry* and *happy*; Set 5: *angry* and *sad*; and Set 6: *sad* and *angry*. Following the antecedent: *"How do they feel?"*, while being shown two face cards placed next to each other on the table (e.g., a *happy* face was placed next to a *sad* face), the participants were taught to tact "*happy* then *sad*". During teaching, a full echoic prompt was provided for each set.

In addition to the tacts, participants were taught to sequence symbol cards on a sequencing board in the order of change of emotions displayed by the cards. During instruction, the participants were provided a gestural prompt (e.g., pointing), where the teacher pointed to the symbol card needed, and directed the child to the correct place on the sequence board. Symbols of the target emotions, plus a set of three distracter symbols, were clearly displayed on a choice board next to the sequencing board (the distracter symbols were randomly chosen from: *surprised*, *scared*, *thoughtful*, and *tired*). The tacting, and the symbol sequencing, were shaped as simultaneous behaviours, while the full echoic and gestural prompts were provided until three consecutive session of responding at 100% was maintained.

6.2.7 Independent/Tacting (Photo Cards)

During the Independent/Tacting phase (*static* condition), participants were presented with two expression photo cards (from *happy*, *sad*, and *angry*), placed side by side (organised as sets of two, and to include *happy* and *sad*, *sad* and *happy*, *happy* and *angry*, *angry* and *happy*, and *sad* and *angry*), with a sequencing board and picture symbols for the target responses in view (plus three distracter emotion symbols selected from *surprised*, *scared*, *thoughtful* and *tired*). During this phase, the echoic and gestural prompts were completely faded, and participants were expected to tact and sequence the *private events* unprompted following the antecedent: "How did they feel?. The independent *static* phase was maintained until three consecutive session of 100% correct responding was achieved.

6.2.8 Teaching Tacting (from Video)

During the Teaching/Tacting phase (*dynamic* condition), a short video clip (8 to 10 seconds long), of a face changing expression across the target emotions from onset to ending (*happy* to *sad*, *sad* to *happy*, *happy* to *angry*, *angry* to *happy*, & *sad* to *angry*), was shown to the participants (e.g. *happy* face changes to a *sad* face), counterbalanced across participants. Following the antecedent: "How do they feel?" participants were taught to tact the change in *private events* observed with a full echoic prompt, and to sequence symbol cards on a sequencing board, in the order of change, with a gestural prompt provided (across all six sets). Symbols of the target emotions plus three distracter symbols, were clearly displayed on a choice board next to the sequencing board (the distracters included symbols randomly chosen from *surprised*, *scared*, *thoughtful* and *tired*). The tacting and the symbol sequencing were shaped as simultaneous behaviours, while the full echoic and gestural prompts were provided until three consecutive session of responding at 100% was maintained.

6.2.9 Independent Tacting (from Video)

During the Independent/Tacting phase (*dynamic* condition), participants were presented with a short video clip of a face changing emotions (to include *happy* to *sad*, *sad* to *happy*, *happy* to *angry*, *angry* to *happy*, & *sad* to *angry*), counterbalanced across participants. Following the antecedent: "How did they feel?" the participants were expected to tact the *private event*s in sequence (e.g. *happy* then *sad*). Parallel to this response, participants were required to sequencing the emotions with picture symbols for the target responses, which were available on a symbol board (which included three distracter emotion cards selected randomly from *surprised*, *scared*, *thoughtful*, and *tired*).

During the independent phase, the echoic and gestural prompts were completely faded, and participants were expected to tact and sequence the *private events* following the antecedent: "How did they feel?", independently. The independent *dynamic* phase was maintained until three consecutive session of 100% correct responding was achieved.

6.2.10 Return-to-Baseline

During the return-to-baseline phase, baseline conditions were maintained, requiring participants to tact the changes in emotion, from the *dynamic* presentation, in sequence for each of the six sets of emotion pairs. Following the antecedent: "How did they feel?" the participants were expected to tact the *private event*s in the order in which they were displayed, and place the corresponding symbols onto the symbol board in the correct order. A measure of correct responding was taken during this phase, for five consecutive sessions, which included symbol sequencing, vocal responses, or signing, as was appropriate for each child.

6.2.11 Generalization Probe

During the generalization probes, untrained video clips, using models not previously used, were show to the participants across the six target sets, to determine whether the responses would generalize beyond the instructional sets. During this phase two untrained videos for each of the sets were presented to the children, and a measure of correct responding was taken, requiring the participants to tact the onset emotion and the end emotion, sequencing the change in the correct order. A correct response required both symbol sequencing, paired with vocal or signing, as was appropriate for each child.

6.2.12 Inter-Observer Agreement

Inter-observer agreement was calculated using Cohen's Kappa to control for chance agreements, calculated across 100% of the sessions for each of the children (see Table 6.2).

Table 6.2: Inter-observer agreement across baseline, teaching photo cards, tacting photo cards, teaching video, and tacting video, reported as Cohen Kappa.

Inter-observer Agreement: Phases

	Baseline (A)	Teaching (B) Photo Cards	Tacting (C) Photos Cards	Teaching (D) Video	Tacting (E) Video
Student 1	0.78	0.95	1.0	1.0	0.93
Student 2	0.82	1.0	1.0	1.0	0.87
Student 3	0.68	1.0	0.94	1.0	1.0
Student 4	0.94	0.93	1.0	0.78	0.96
Student 5	1.0	0.88	0.96	1.0	1.0
Student 6	0.68	0.84	0.92	1.0	0.96
Student 7	1.0	0.78	1.0	0.96	0.72
Student 8	1.0	1.0	0.92	1.0	1.0
Student 9	0.74	0.83	0.96	0.88	0.87
Student 10	1.0	1.0	0.87	0.74	1.0

The Cohen's Kappa for the Baseline (A) had a mean across participants of 0.86, and ranged from 0.68 to 1.0; for Teaching/ Photo Cards [*static* phase] (B), the mean was 0.92, and the range was between 0.78 to 1.0; for the Independent/ Photo Cards [*static* phase] (C), the mean was 0.86, and the range was between 0.87 and 1.0. In Teaching/ Video [*dynamic* phase] (D) had a mean across participants of 0.94, and ranged from 0.74 to 1.0; for Tacting/ Independent [*dynamic* phase] (E), the mean was 0.93, and the range was between 0.72 to 1.0; while the Return-to-Baseline (A) had a mean was 0.91, and the range was between 0.68 and 1.0. Agreement for the Generalization Probe (F) across subjects had a mean of 0.96, and ranged between 0.89 and 1.0 (see Table 6.3).

Table 6.3: Inter-observer agreement for generalization probes, reported as Cohen Kappa.

Inter-observer Agreement: Probe	
	Generalization Probe
Student 1	1.0
Student 2	1.0
Student 3	0.89
Student 4	0.92
Student 5	1.0
Student 6	0.96
Student 7	1.0
Student 8	0.90
Student 9	1.0
Student 10	0.98

6.3 Results

Figure 6.1: Correct responses across baseline, teaching photo cards, tacting photo cards, teaching videos, tacting video, return-to-baseline, and generalization probes for student 1 and 2.

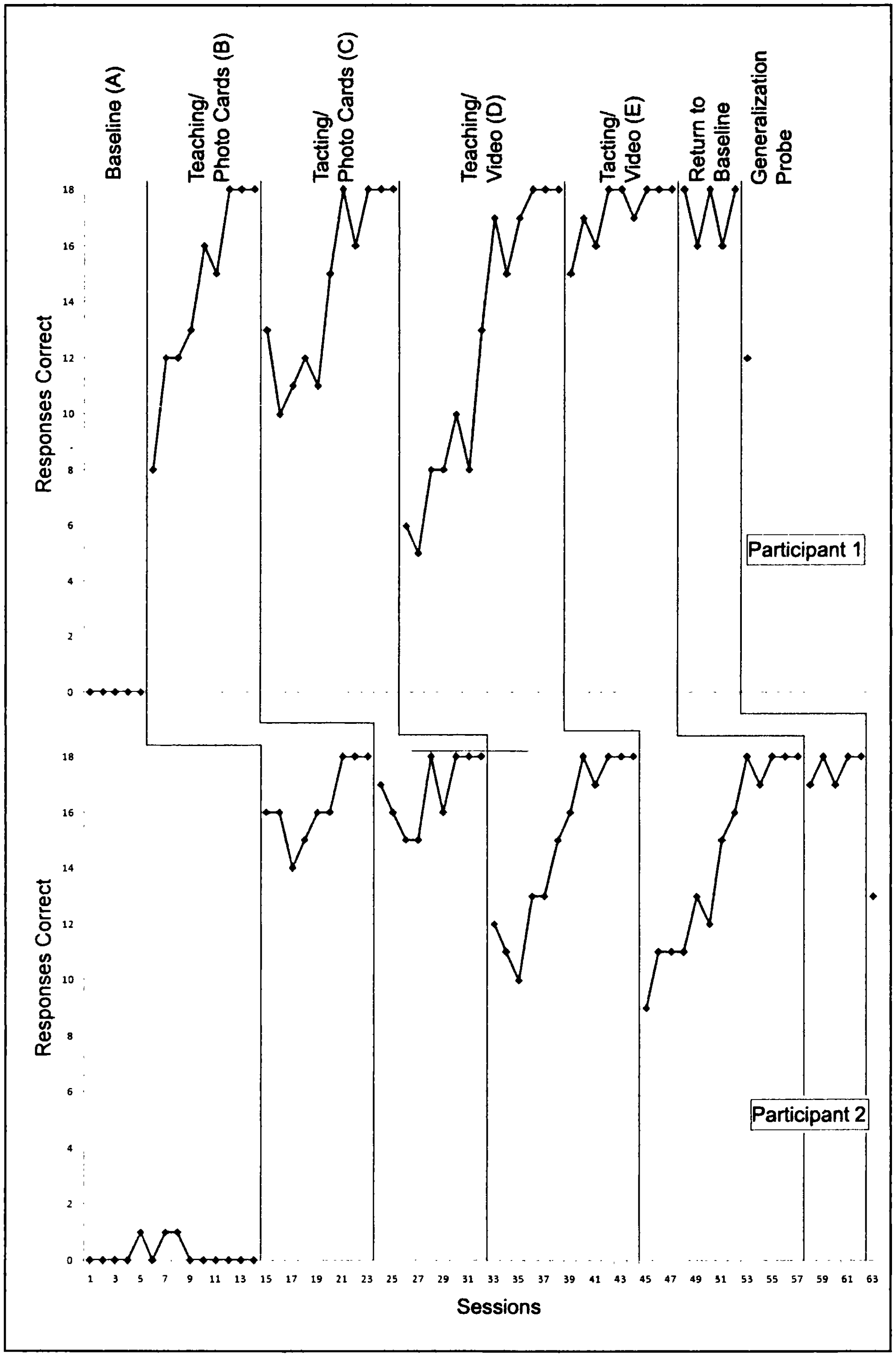


Figure 6.2: Correct responses across baseline, teaching photo cards, tacting photo cards, teaching videos, tacting video, return-to-baseline, and generalization probes for student 3 and 4.

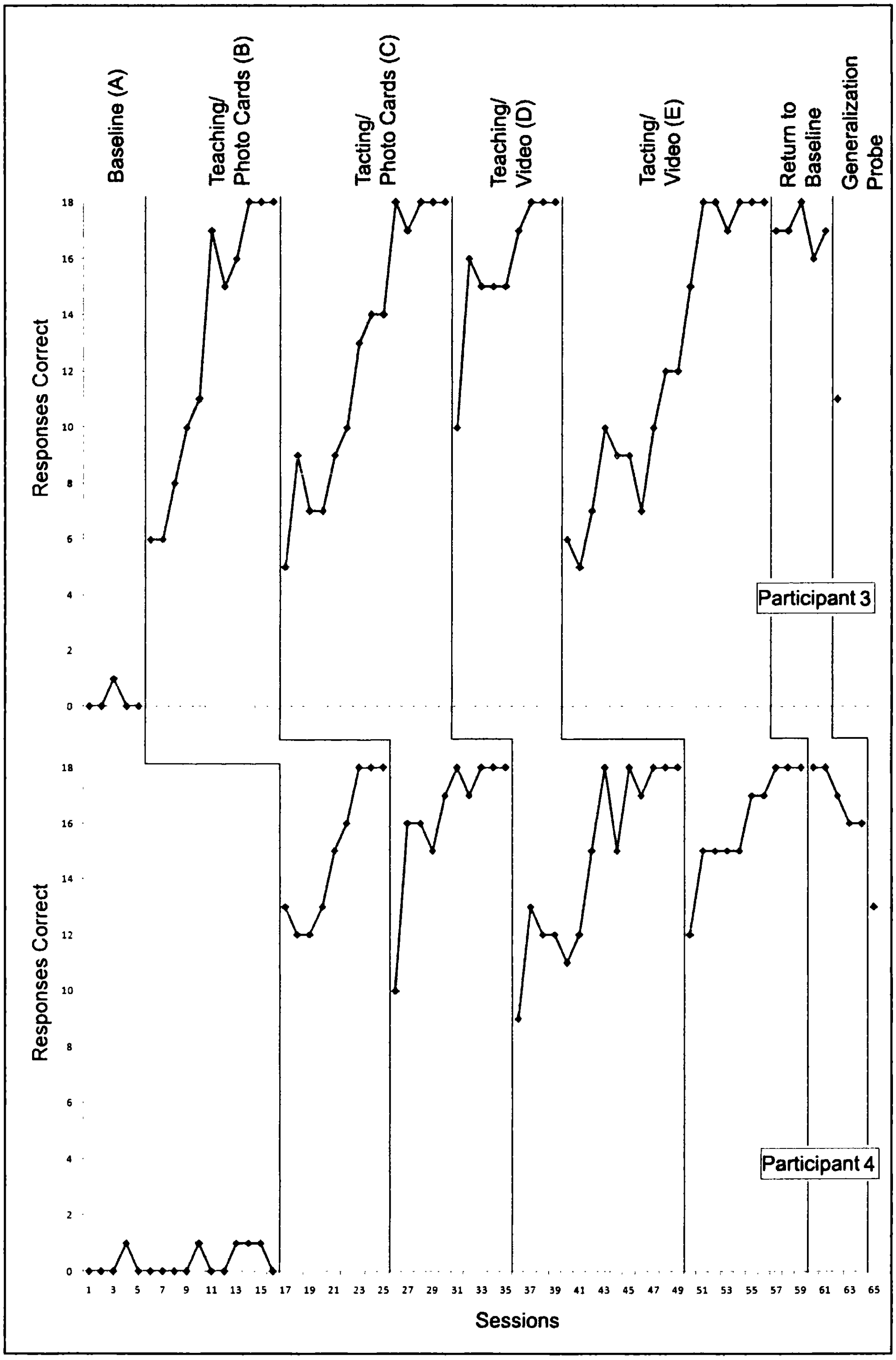


Figure 6.3: Correct responses across baseline, teaching photo cards, tacting photo cards, teaching videos, tacting video, return-to-baseline, and generalization probes for student 5 and 6.

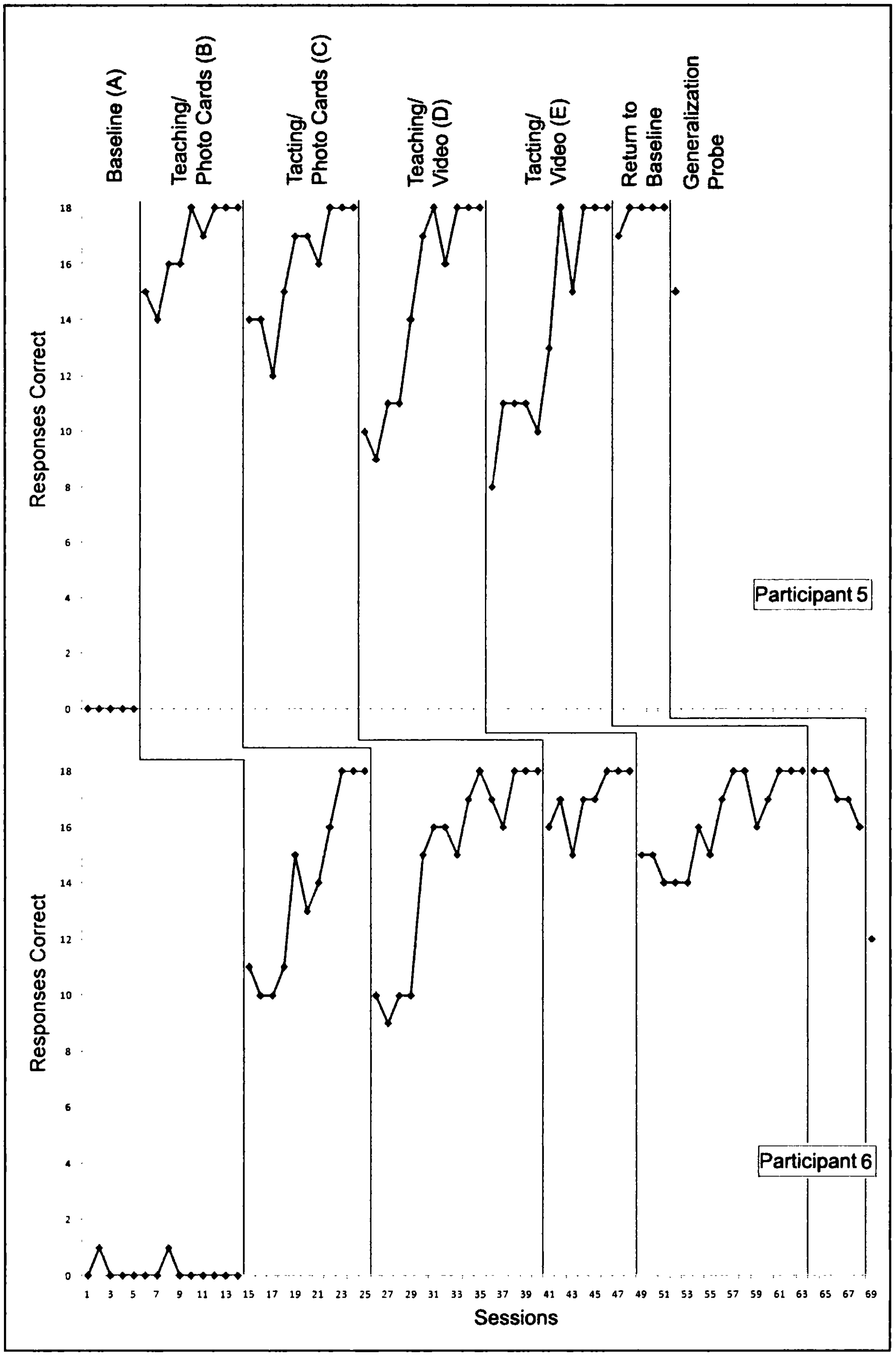


Figure 6.4: Correct responses across baseline, teaching photo cards, tacting photo cards, teaching videos, tacting video, return-to-baseline, and generalization probes for student 7 and 8.

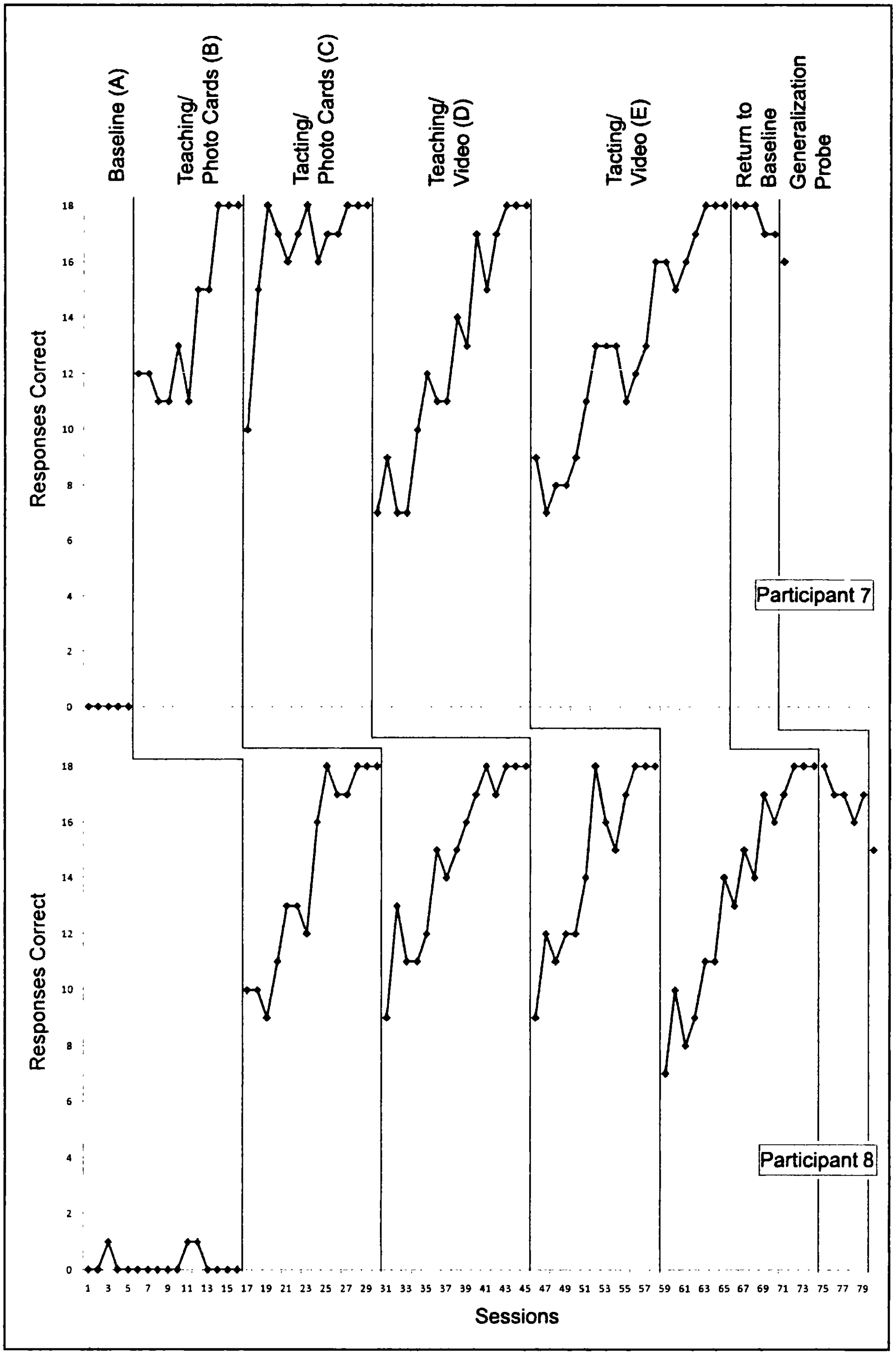
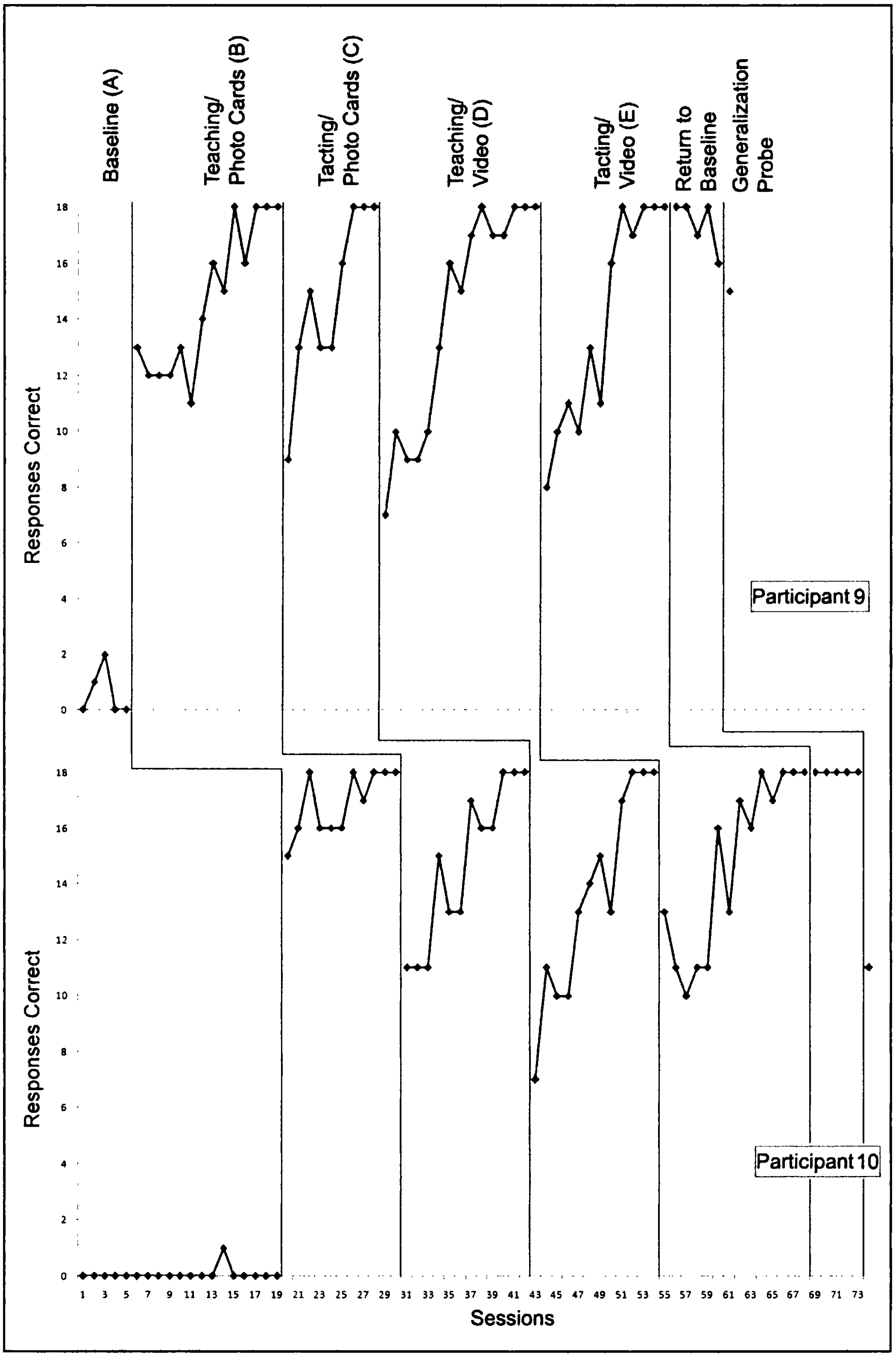


Figure 6.5: Correct responses across baseline, teaching photo cards, tacting photo cards, teaching videos, tacting video, return-to-baseline, and generalization probes for student 9 and 10.



The results presented in Figures 6.1 to 6.5 show the responses of Participants 1 to 10 in the Baseline (A), Teaching acting/ Photos [*static*] (B), Independent Tacting/ Photos [*static*] (C), Teaching Tacting/ Video [*dynamic*] (D), Independent Tacting/ Video [*dynamic*] (E), Return-to-Baseline (A), and Generalization probe across untrained models [*dynamic*] (F). Overall, the results suggest that: (a) the use of photo cards (*static*), presented as a sequence (e.g. *happy* then *sad*), are an effective tool for teaching children with ASD the language necessary to tact changes in *private events*, (b) the use of short video clips (*dynamic*) showing a models changing expression can teach children with ASD to recognise the facial cues necessary to tact changes in emotion, and (c) this understanding could then be generalized to untrained faces.

During the Baseline (A), a mean of 0.3 correct responses (range 0 to 2) across participants were recorded per session, across the ten participants, in response to the antecedent: "How did they feel?' after viewing a change in emotion, seen on the video (*dynamic*). This suggests that the participants were not able to independently tact the change in *private event* in the 8 to 10 second video clip.

In the first Teaching (B) phase (*static)* the participants learned to tact the sequence of *private events*, which corresponded to the two photos on view, for the six target pairs being trained. A mean of 15.1 correct responses across participants per session was recorded, with a range of 8 to 18 correct. Independent Tacting (C) for the *static* condition followed the first teaching phase (*static*), and a mean of 15.2 across participants, and a range of 5 to 18 correct responses were recorded. Correct responses across participants increased from a M=11.9 correct during the first session to a M=18 correct during the last session.

Following the *static* phases (both Teaching and Independent), a *dynamic* Teaching phase (D) was introduced, requiring participants to view of video clip of a model changing expression across the target pairs. During this training phase, a mean of 14.5, and a range of 6 to 18 correct responses across participants were recorded. Independent Tacting (E) for the *dynamic* condition followed the second teaching phase (*dynamic*), and a mean of 14.5 across participants, and a range of 7 to 18 correct responses were recorded. Correct responses across participants increased from a mean of 9.3 correct, during the first session, to a mean of 18 correct during the last session.

During the Return-to-Baseline phase, conducted for five sessions for each participant, there were a range of 16 to 18 correct responses emitted across the ten subjects, with a mean of 17.2 correct responses across subjects being recorded, offering evidence that the subjects had learned to independently tact the changes in *private event*s of others, following both *static* and *dynamic* teaching and independent responding phases. Although there was some variability in responding across participants during the return-to-baseline, with a range of 16-18 correct, there was nevertheless a mean of 17.6 correct during the first session, and a mean of 17 correct during the last session

The subsequent generalization probe, during which untrained video clips (*dynamic*) were show to evaluate the effectiveness of the of the training across new models, showed increased levels of correct responding when compared to the baseline results, with a mean of 13.1 correct responses across participants, although the overall level of correct responding was not as high as the taught videos (mean of 14.5), or during the Return-to-Baseline (mean of 17.2). This data suggest that, although the ability to tact changes of *private event*s can be generalized, the complexity of recognizing the facial cues across untrained faces does reduce the generative nature of this skill for children with ASD. There appeared to be a greater level of generalization across models for this stage, with a mean correct across participants for each the four models, ranging from 12.8 to 13.5 across the models. A greater degree of variability was seen in differences between pairs of emotions across participants; *happy* to *sad* (mean of 15.8), *happy* to *angry* (mean of 13.9), *sad* to *happy* (mean of 14.8), *sad* to *angry* (mean of 9.6), *angry* to *happy* (mean of 15.3), and *angry* to *sad* (mean of 9.4). During generalization, a mean of 19.9 across participants was found when *happy* was one of the emotions targeted, a mean of 12.4 for those that included *sad* was recorded, and a mean of 12.9 for *angry* was found.

6.4 Discussion

This study investigated whether, or not, it was possible to teach children with ASD to tact the changes in the *private events* of others. A measure of generalization across untrained models was also taken, during which participants were required to tact sets of emotions from onset to ending (e.g., *happy* then *sad*, *happy* then *angry*, *sad* then *happy*, *sad* then *angry*, *angry* then *happy*, and *angry* then *sad)*. This investigation is unique in the growing body of research into the social emotional development of children with ASD, while the systematic instruction in "emotional shifts", both in *static* and *dynamic* conditions, has not previously been attempted.

It was proposed in this study that children with ASD could acquire the skills to tact changes in emotion, based on facial cues made available from a full face view, following targeted instruction in both *static* (photos) and *dynamic* (video) presentation. The data from all children in this study showed that tacts for *private events*, and an ability to tact changes in the expression of emotion increased during instruction, both *static* and *dynamic*, and was learned and then maintained in both the return-to-baseline, and the generalization phases. These data suggest that children with ASD can be taught to tact changes in emotion, and may possess the capacity to develop the socially significant behaviour of understanding the emotional states of others, as they occur.

The apparent difficulty that children with ASD face when recognising emotion, and the changes that can occur in such emotions, might stem from motivational impairments in either the reward system for attending to the emotions of others (Kampe, Frith, Dolan & Frith, 2001), from the joint attention skills required to interpret the available cues (Klin, Jones, Schultz, Volkmar & Cohen, 2002; Neuman, Spezio, Piven & Adolphs, 2006), or to neural systems that might be important for the perception of social reward, such as the ability to form representations of others as being "like me", similar in some way (Decety & Sommervilee, 2003). In order to establish an understanding of how to tact the *private events* of others, children with ASD need to overcome limitations of implied interest in the emotional expressions of others, limitations in joint attention, and their implicit misunderstanding of "other" being like themselves.

The sequence of teaching, from *static* to *dynamic* stimuli used in this study grew from the suggestion that skill competencies, versus developmental sequence, (Fischer, 1980; Fischer & Silvern, 1985), would provide a successful starting point for instruction. Due to the competency children with ASD display tacting *static* stimuli (LaBar, Crupain, Voyvodic & McCarthy, 2003; Pelphrey, Morris, McCarthy & LaBar, 2007), it was believed that there would be an improved outcome in the *dynamic* stage once the language of the *private events*, and idea of sequencing the change, had been modelled in a phase not requiring either an interest in "other" or the joint attention expected of social involvement (Adolphs, Sears & Piven, 2001; Dawson, Meltzoff, Osterling, Rinaldi & Brown, 1998; Dawson, Meltzoff, Osterling, Rinaldi & Brown, 1998). In the context of the *behavioural cusps*, it is then important to consider what happens after any behaviour change, and by teaching the participants to successfully tact *static* images, transfer of this skill was made easier in the *dynamic* teaching phase that followed. The data itself illustrates the apparent differences in *static* versus *dynamic*, in the number of instructional opportunities in each phase, with the *static* phases requiring mean of 22.8 sessions, and mean of 26.1 in the *dynamic*, across participants.

The current research looked functionally at whether children with ASD could reliable tact the changes in *private events* expressed by another, and supports the suggestion that individuals with ASD can use affective information from multiple sources (verbal and nonverbal) in much the same way a person of comparable developmental levels (without ASD) to recognise emotion, and benefited when the emotion was explicitly named, compared to having to infer the tact (Loveland, Tunali-Kotoski, Chen, Ortegon, Pearson, Brelsford & Gibbs, 1997). Children with ASD appear to be less attentive to the expression of emotion without targeted instruction in the language of *private event*s, and have also shown improved rates of correct responding in photo identification tasks when asked to make socially relevant (tacting situational context) decisions regarding the expression of an emotion (Celani, Battacchi & Arcidiacono, 1999; Rieffe, Terwogt & Stockman, 2006). It also supports the suggestion that children with ASD can successfully tact selected emotions, when consideration is given to the speed of exposure of the *dynamic* emotion change (Gepner, Deruelle & Grynfeltt, 2001), as well as in the instructional sequence.

The participants in this study had previously been taught a set of tacts for *private events* (*fun, boring, liked, & don't like*), that were shown to function as conditioned reinforcers (Chapter 2), and to initiate a conversational unit, to include a tact for a *private event*, when prompted with visual "talk" card on their activity schedules (Chapter 3). In the third of these studies, increasingly more complex language, where agreement between the subject, verb and comment (*private event*), was successfully taught to children with autism, further enriching their social language repertoire (Chapter 4). Tacts for *fun*, *boring*, *like*, *don't like*, *hard*, and *easy* were used in both the previous studies. The most recent study taught children with ASD to tact the *private events* of others, but matching situations to emotions (*happy*, *sad*, and *angry*.

Together, these studies offer some initial evidence that having access to sets of tacts for *private events*, can function as a conditioned reinforcer, be effectively prompted with visual support in the context of an activity schedule, provide a tool for teaching more advanced linguistic skills to children with ASD, and offer the opportunity to tact the public correlates of the *private events* of others. With this study, it has been suggested that children with ASD can also be taught to tact the change in expression of emotion, across target *private events*, when clearly scripted instruction in recognizing the facial cues necessary to recognize emotion has been provided.

Although children with ASD have been shown to continually perform worse than their mental and chronologically aged-matched peers on tests of face discrimination (Tantam, Monaghan, Nicholson & Sterling, 1989), face recognition (Boucher,& Lewis, 1992), and emotion perception and recognition (Gepner, de Schonen & Buttin, 1994), interventions focused on learning new faces, and on learning facial expression interpretation remain a robust area of continued inquiry (Hobson, Ouston & Lee, 1988). One area of future research would be to test whether the tacts for *private events* of others taught in this study could be taught in the context of situation information, requiring the child to tact the expression of emotion through the experience of situation-based emotions, considered a central deficit in the acquisition of "theory of mind" (Howlin, Baron-Cohen & Hadwin, 1999).

The findings of this study are encouraging, and should be interpreted in the context in which they were measured, and not as an indication that the participants have learned a generative understanding of *private events* of others under investigation, but instead as an indication that explicit teaching needs to address the deficits that children with ASD experience in understanding the emotions of others. This study has shown that despite the difficulties children with ASD have with understanding emotion, procedures can be successfully implemented to improve their ability to tact the *private events* of others, in both *static* and *dynamic* conditions, offering a skill with social validity and significant generative value.

7 THE EMEREGNT EFFETCS OF AN INTERVENTION TO TEACH *PRIVATE EVENT*S TO CHILDREN WITH ASD: IMPACT ON THEORY OF MIND AND LANGUAGE.

7.1 Introduction

The impact of systematic instruction in the language of *private events*, as part of a broader verbal behaviour programme for children with Autistic Spectrum Disorders (ASD), has received little attention in behaviour analytic research (see Friman, Hayes & Wilson, 1998a, 1998b; Lamal, 1998). Instead, the focus has remained on teaching functional *mands* and *tacts*, with a generative expectation for more socially derived language to emerge as a result (Lovaas, 1981; Maurice, Green & Foxx, 2001; Maurice, Green & Luce, 1996; Sundberg, 1998; Partington & Sundberg, 1998). However, this emergent ability is not always observed for children with ASD, who struggle not only with the *semantics* and *pragmatics* of the language of emotion (Baltaxe, 1977; Bretherton & Beeghly, 1982; Charlop & Walsh, 1986; Hobson, 1986a; Hobson, Ousten & Lee, 1989; Prutting, 1982; Tager-Flusberg, 1992), but also with many of the pre-requisite behaviours for social interaction (Bolting, & Conti-Ramsden, 2000; Buitelaar, 1995; Chin & Bernard-Opitz, 2000; Dawson, Troth, Abbot, Osterling, Munson, Estes & Liaw, 2004; Donley & Greer, 1993; Howlin, 1986; Hwang & Hughes, 2000). Given this, targeted instruction in tacting *private events*, combined with programmes to measure the *semantic* and *pragmatic* awareness displayed by children with ASD, might be required.

An extensive body of evidence has shown that Applied Behaviour Analysis (ABA) has been successful in teaching children with ASD to tact specific behaviours in context, and has shown that these skills generalize to novel contexts (Partington & Sundberg, 1998; Schauffler & Greer, 2006). Despite these findings, there is still little clear evidence that these particular successes have any impact on the core deficits of ASD, particularly in regards to the social language deficits that are central to the disorder. Instead, ABA has consistently improved functional outcomes for children with ASD, improving developmental (Lovaas & Smith, 1989; McEachin, Smith & Lovaas, 1993), language (Bourret, Vollmer & Rapp, 2004; Charlop-Christy, Carpenter, LeBlanc & Kellet, 2002; Jones, Feeley & Takacs, 2007; Murphy, Barnes-Holmes & Barnes-Holmes, 2005; Taylor & Harris, 1995; Williams, Donley & Keller, 2000; Young, Krantz, McClannahan & Poulson, 1994), and cognitive deficits (Harris, Handleman, Gordon, Kristoff & Fuentes, 1991), while the severity of the ASD appears to remain unchanged (Freeman, Rahbar, Ritvo, Bice, Yokota & Ritvo, 1991; Gresham & MacMillan, 1997; Reed, Osborne & Corness, 2007). This may be due to the fact that what is being taught in behaviour analytic settings, and in *Verbal Behaviour* ABA programmes, is not addressing the nature of the social language that is intrinsic to the core deficits of ASD (Frith, 1989; Kanner, 1943; Rutter, 1968). In part, this may be because the measures being made in functional language programmes address other deficits (e.g. *pure manding, tacting, intraverbals*).

In the series of studies reported in this thesis, children with ASD were systematically taught sets of *private event*s, to generalize these, and to tact the public correlates of the *private events* of others. This approach to language instruction was found to result in improvements across new and untrained language areas. Although the intervention focused specifically on tacting *private events*, and the functional outcomes associated with this instruction (e.g., increased levels of spontaneous language, decreased inappropriate behaviour, improved social skills), it was also hoped that more generative language gains and changes in core deficits (e.g. perspective taking skills) would result. This latter, and more general outcome, has not been examined in the preceding chapters.

By comparing the performance, across a set of *semantic* and *pragmatic* language scales, between matched groups, who received, or did not receive, the intervention, this study was designed to assess gains across untrained areas of development as a benefit to the instruction in *private events.* Standardized and norm referenced assessments, including the *Clinical Evaluation of Language Fundamentals-4* (CELF-4), the *Test of Pragmatic Language* (TOPL), the *Boehm-3* (a test of linguistic concepts), were used a measures across both the "Intervention" and "No-Contact Control" groups to assess improvements across untrained behaviours.

In addition, central to the social and language deficits of ASD, is an inability to "perspective take" or to demonstrate a Theory of Mind (Baron-Cohen, Leslie, & Frith, 1985; Wimmer & Perner, 1983). Initially it was suggested that such an ability was a *static* determinate (Baron-Cohen, Leslie & Frith, 1985; Wimmer & Perner, 1983), although more recent research has suggested that this ability may be learned (Bowler, Stormm & Urquhart, 1993; Hadwin, Baron-Cohen, Howlin & Hill, 1996). To help establish whether a protocol for teaching *private event*s impacts on this ability, a measure of "false-belief" was also taken across both groups, both pre and post intervention.

Thus, the purpose of the study was to determine whether there were collateral gains in generative language, to the instruction in *private events*, which were not directly taught or measured. This was accomplished by making a comparison of pre and post testing scores across selected measures for both the Intervention Group and the Control Group, who were similarly matched in abilities and severity of ASD.

7.2 Method

7.2.1 Participants

Twenty children with ASD participated in this study. Ten children (8 male and 2 female) participated as the "Intervention Group", aged between 5.3 and 8.9

years (M = 6.4 years) during pre-testing, and 6.8 and 11.1 years (M= 7.9 yrs) during post-testing. Ten children (9 male and 1 female) participated in the "No-Contact Control Group", aged between 5.3 and 8.1 (M= 6.5yrs) during pre-testing, and 6.6 and 9.4 (M= 7.8 yrs) during post-testing. All of the children had been diagnosed by an independent paediatrician with childhood autism, and had Gilliam Autism Rating Scale (GARS) quotients of between 68 and 111.

Table 7.1 Mean baseline scores across participants for measurement tool, and t-test scores for each test to determine probability (probability significant if less than $p < 0.05$)

Measure	*Intervention*	*Control*	*t-score*
GARS	91.3	90.2	0.87
TOPL			
Raw Score	13.5	12.1	0.43
CELF-4			
Composite Score	67.5	76.5	0.23
Boehm-3			
Raw Score	29.4	28.7	0.82
ToM			
Failed	100%	100%	n/a
Passed	0%	0%	n/a

Note: *Gilliam Autism Rating Scale* (GARS), *Test of Pragmatic Language* (TOPL) *Clinical Evaluation of Language Fundamentals-4th Edition* (CELF-4), *Boehm Test of Basic Concepts – 3* (Boehm-3), and *Theory of Mind Test* (ToM). All standard scores (mean = 100, standard deviation = 15), except ToM, which is not a norm referenced measure.

The group-mean characteristics of the participants in the two groups at the start of the study (baseline) are shown in Table 7.1. Inspection of these data shows no statistically significant differences between the two groups on any measure at baseline, indicating that they were well matched on all variables

All 20 participants were receiving home-based ABA instruction (designed as a component programme of the CABAS® systems approach to education; see Greer, 2002), which also included part-time placements in mainstream and special education schools. At the time of pre-testing, the participants in the Intervention group had a mean of 11 independent vocal verbal behaviours, a mean of 76 picture symbols, and a mean of 32 Makaton Signs® in their repertoires. Participants in the No-Contact Control group had a mean of 18 vocal verbal behaviours, a mean of 86 picture symbols, and a mean of 13 Makaton Signs® in their repertoires. This count of verbal behaviour suggests that the participants in the two groups were evenly matched regarding their verbal skills. The full description of the participants in the two groups is given below.

7.2.1.1 Intervention Group

From the "Intervention Group", students 1, 2, and 3 were in full time special schools; Students 4, 5, 6, 7, and 8 were in school for a three-hour morning session; and Students 9 and 10 attended a two-hour afternoon session. All of the children used an augmented picture symbol system (PECS®), and had some Makaton Signs® (manual sign), in their repertoires to aid their communication skills. Eight of the children (Students 1, 2, 3, 5, 6, 7, 8, & 9) used vocal verbal behaviour to *mand* and *tact*, as well as respond to *intraverbals* and social initiations. Two participants (Students 4 & 10) did not use any vocal verbal behaviour to communicate, but instead had a well developed use of PECS®, which were occasioned by a limited range of sound production.

All ten participants in the Intervention Group had been taught to tact *fun, boring, easy, hard, like,* and *didn't like* in three previous studies (see Chapter 2, 3, &

4), and to tact *happy, sad*, and *angry* (see Chapter 5 & 6), as well as to use *yes* and *no* to confirm their response (see Chapter 3 & 4), when internal validity was tested. These children had also been taught to follow a visual schedule, and to respond to a *talk* prompt, by initiating a conversational unit with a language partner, commenting on a play activity after completion (see Chapter 3 & 4).

7.2.1.2 No-Contact Control Group

Of the students in the "Control Group", students 2, 6, 7, 8, and 9 were in full time special schools; Students 1, 5, and 10 were in mainstream school for two full days per week; and Students 3 and 4 were receiving full-time home programmes. All of the children used an augmented picture symbol system (PECS®), and had some Makaton Signs® (manual sign), in their repertoires to aid their communication skills. Nine of the children (Students 1, 2, 3, 5, 6, 7, 8, & 9) used vocal verbal behaviour to *mand* and *tact*, as well as respond to *intraverbals* and social initiations. One participant (Student 4) did not use any vocal verbal behaviour to communicate, but instead used a PECS® system to communicate, and understood and used about 25 Makaton Signs®.

None of the "Control Group" participants had been systematically taught to tact any *private events*, although they were taught to use *yes* and *no* both as part of their verbal behaviour programme, and to respond in preference assessment protocols for selecting reinforcement. The "Control Group" participants had been taught to follow a visual schedule, and although the *talk* prompt (see Chapter 3 & 4) had not been introduced into their social communication programme.

7.2.2 Measures

7.2.2.1 ***The Gilliam Autism Rating Scale -2*** (Gilliam, 1995) was used to measure autistic severity. The GARS is a 44-item checklist with 4 sub-scales: *Behaviour, Communication, Social Interaction, and Developmental Disturbances.* For individuals who do not talk, sign, or use any form of communication, the subscale of *Communication* is not administered. The items are based on the diagnostic definitions from the DSM-IV (American Psychiatric Association, 2000). The sum of the sub-scale scores can be converted into an Autism Quotient, which is a standard score that has a mean of 100, and a standard deviation of 15: 100 represents average autistic severity.

The internal consistency of the items on the GARS-2 was determined using Cronbach's coefficient alpha (Cronbach, 1951), the resulting coefficients for each subscale were Stereotyped Behaviours .84; Communication .86; Social Interaction .88; and for the total test (all 42 items) .94, suggesting that items in the subscales are quite consistent (Gilliam, 1995). The stability reliability (time sampling), revealed coefficients beyond the .01 level of significance, and of sufficient magnitude to suggest that the GARS-2 has good test-retest reliability as a tool to identify people with ASD (Gilliam, 1995). The GARS is not a norm-referenced assessment, and cannot, therefore be used for diagnostic purposes

7.2.2.2 ***Test of Pragmatic Language*** (Phelps-Terasaki & Phelps-Gunn, 1992) was used to measure the pragmatic, or social, dimensions of language. The test provides information across six core subgroups of pragmatic language, including physical setting, audience, topic, purpose (speech acts), visual-gestural cues, and abstraction. The test assesses difficulties in pragmatic language skills in individuals with learning difficulties, language delays or disorders, reading impairments or aphasia. The results are reported in terms of quotients, percentile ranks, and age equivalents. Quotient scores allow the examiner to compare the test's scores with each other, and other tests that report scores using a similar distribution (*M*=100, *SD* = 15). Percentiles (%) indicate the percentage of scores in the norm sample that were at or below the child's score, while age equivalents compare the child's score with the age at which other children scored a similar number of correct responses.

The internal consistency reliability coefficients averaged .82, and the inter-scorer reliability assessment resulted in a coefficient of .99, providing sufficient evidence of the acceptability of the interscorer reliability (Phelps-Terasaki & Phelps-Gunn, 1992).

Testing content-description validity, criterion-related validity, and construct-identification validity determined validity of the TOPL. The validity of the TOPL demonstrate that: (a) systematic and controlled items selection and analysis were applied to building the assessment tool; (b) a coefficient of .82 provides evidence of concurrent validity; (c) the scores increase with age with a coefficient of .55; (d) the correlation coefficient between the *SCREEN Language Subtest* (Hresko, Reid, Hammill, Ginsburg & Baroody, 1988) and the TOPL was .70; the relationship between the TOPL and school achievement revealed correlation coefficients of .32 with mats, .39 with writing and .55 with reading, using the *SCREEN* Subtests for math, writing and reading; while the relationship between the TOPL and mental ability was found to be .68, when compared to scores of the *Scholastic Aptitude Scale* (Bryant & Newcomer, 1991).

*7.2.2.3 **Clinical Evaluation of Language Fundamentals – Preschool: 2nd Edition*** (Semel & Wiig, 2006) was used to measure a broad range of expressive and receptive language skills in young children 3 to 6.11 years). The assessment consists of six diagnostic subtests. These subtests include basic concepts, sentence structure, word structure, formulating labels, linguistic concepts and recalling sentences in context. Raw subtest (or composite scores) of 3 receptive and 3 expressive tests are converted into standard scores with selected confidence intervals, percentile ranks and age equivalents.

Reliability of the CELF-Preschool reveal a total language score reliability for internal consistency of between .86 to .96, suggesting high levels of consistency, while the internal structure of the test is such that the results are repeatable. Construct validity measures made by comparison with the Preschool Language Scale-3 (Zimmerman, Steiner & Pond, 1992), the Weschler Preschool and Primary Scale of Intelligence-Revised (Weschler, 1989), and the Differential Ability Scales-II (Elliot, 1990) suggest high levels of validity (Semel & Wiig, 2006).

7.2.2.4 **The *Clinical Evaluation of Language Fundamentals - 4*** (Semel, Wiig & Secord, 2006) was used for children between 6:11 to 21 years of age to measures a broad range of receptive and expressive language skills in children and adolescents. The test includes eleven subtests, including sentence structure, word structure, concept directions, formulated sentences, word classes, recalling sentences, sentence assembly, semantic relationships, word associations, listening to paragraphs, and rapid automatic naming. Raw subtest (or composite scores) of 3 receptive and 3 expressive tests are converted into standard scores with selected confidence intervals, percentile ranks and age equivalents.

The test-retest reliability for the overall sample (ages 6 to 21:11) was calculated using Fischer's z transformation correlation coefficient, and range from .71 to .86 for subtests and from .88 to .92 for composite scores based on the standardized population. Internal consistency, using Chronbach's alpha, ranged from .69 to .91 for subtests and from .87 to .95 for composite scores, while interscorer decision agreement for clinical decisions and interpretation of scoring rules raged from .88 to .99 (Semel, Wiig & Secord, 2006).

The validity evidence for the CELF-4 is based on test content, response processes, internal structure, relationships with other variables, and consequences of testing. Validity measures were conducted with students identified as having a language disorder, those diagnosed with mild ASD, hearing impaired and with mental retardation, and suggest high levels of validity for the CELF-4 as a measure of language abilities in children, adolescents and young adults.

The tests used depended upon the age of the child, as the CELF-4 is normed on children between the ages of 3 and 6, where as the Pre-CELP is appropriate fro children aged between 5 and 16. This meant that at baseline, some of the children required the Pre-CELF, while at post testing the CELF-4 was appropriate.

7.2.2.5 Boehm Test of Basic Concepts- Third Edition (Boehm, 2001) was used to assess mastery of the basic linguistic concepts that are fundamental to understanding verbal instruction, which are also essential for early school achievement. The Boehm-3 is an instructional screening instrument, and a diagnostic tool, that is used to advise parents and teachers in the instruction of concepts with which the child is having difficulty. The developmental domains considered in the test include visual and language comprehension.

The Boehm-3 should be used in combination with a battery of other tests for purposes of assessment and for identifying "at risk" areas. The Boehm-3 is both "norm" and "criterion" referenced, and is typically administered to children between the ages of 5 and 8 years old, or to those first entering full-time school (Kindergarten). The "Raw Score" reflect the total number of correct responses out of 50 questions, also reported as a percent correct. The percentile (%) rank indicates the percentage of scores in the norm sample that were at or below the child's scores.

The reliability of the Bohem-3 was determined by checking internal consistency, and the coefficient alphas for the Bohem-3 ranged from .85 to .92 (Boehm, 2001). The Bohem-3 suggests evidence of validity based on test content, relations to other variables, and test criterion. The content of the test is based on an extensive review of multiple sources, while two studies assessed the tests relationship to other variables. The first looked at a comparison to the Bohem-3 and to the earlier Boehm-Preschool (a correlation coefficient of .84 provides evidence of concurrent validity), while the second study looked at the relationship to the Bracken Basic Concept Scale- Revised (Bracken, 1998), which revealed a correlation coefficient of .80, suggesting that both tests measure many of the same aspects of the constructs of basic concepts.

7.2.2.6 The Theory of Mind "Sally Anne" Test of False Beliefs (see Baron-Cohen, Leslie & Frith, 1985; Howlin, Baron-Cohen & Hadwin, 1999) was used to assess a child's ability to attribute a false belief in order to predict or explain an action. In this test, a puppet labelled a novel object in a false belief condition (contents of a box had been switched without her knowledge), and a true belief condition (contents switched in her presence), requiring the children to predict where the puppet will "belief" the object has been left (Wimmer & Perner, 1983). The Theory of Mind (ToM) test used followed the script adapted by Baron-Cohen, Leslie & Frith (1985), from the Wimmer and Perner (1983) original. The script, which is acted out with small dolls, a basket, a box and a marble, reads as follows:

> *This is Sally. Sally has a basket.*
> *This is Anne. Anne has a box.*
> *Sally has a marble. She puts the marble into her basket.*
> *Sally goes out for a walk.*
> *Anne takes the marble out of the basket and puts it in the box.*
> *Now Sally comes back. She wants to play with her marble.*
> *Where will Sally look?*

The test involves appreciating that as Sally was not present when the marble was moved from its original location, and did not *know* it was moved, she would, therefore, *believe* it was still in her basket. The response to this test is either "in the basket" or in the box". In order to pass the ToM, a reply of "in the basket" is required. The "Sally-Anne Tests" is a pass/fail, and is not a norm-referenced assessment, and cannot, therefore be used for diagnostic purposes.

7.2.3 Intervention

7.2.3.1 Intervention Group. All ten participants in the "Intervention Group" had been taught to tact *fun, boring, easy, hard, like,* and *didn't like* in three previous studies (see Chapter 2, 3 & 4) and to tact *happy, sad*, and *angry* (see Chapter 5 & 6), as well as to use *yes* and *no* to confirm their response (see Chapter 3 & 4), when internal validity was tested. These children had also been taught to follow a visual schedule and to respond to a *talk* prompt, by initiating a conversational unit with a language partner, commenting on a play activity after completion (see Chapters 3 & 4).

7.2.3.2 ***No-Contact Control Group***. None of the "Control Group" participants had been systematically taught to tact any *private events*, although they were taught to use *yes* and *no* as part of their verbal behaviour programme and to assist in preference assessment protocols for selecting reinforcement. The "Control Group" participants had been taught to follow a visual schedule, and although the *talk* prompt (see Chapter 3 & 4) had not been introduced into their social communication programme.

7.2.4 Procedure

A between-group design was used in this study, to determine whether there were additional benefits to the procedures developed to teach tacting of *private events* to children with ASD. Participants were randomly separated into two groups, the “Intervention Group”, and the “Control Group”. At the start of the study, both groups were assessed with the battery of tests, listed above, to determine their degree of autism, language (*expressive* & *receptive*), pragmatic language skills, understanding of linguistic concepts, and “Theory of Mind”.

Participants in the "Intervention Group" were taught, in a series of studies, to tact *private events*, which would then function as a conditioned reinforcer (see Chapter 2), to initiate a conversation based on a tact for a *private event* (see Chapter 3), to build more complex sentences with these tacts (see Chapter 4, to tact the *private events* of others (see Chapter 5), and to tact changes in the expression of emotion of others (see Chapter 6). This instructional sequence was implemented over the course of 15 months. Following the completion of the interventions, participants were re-assessed using the same battery of tests. All the participants continued with their school placements and home based ABA programmes during the intervention.

The "Control Group" were not offered targeted instruction in tacting *private events*, and did not participate in any of the interventions detailed in Chapters 2 to 6. They all, nevertheless, continued in their school placements, and maintained their home-based ABA programmes throughout. After 15 months, the participants in the Control Group were re-assessed with the battery of tools listed above and their scores compared to the Intervention Group to determine the effectiveness of the interventions used to teach children with ASD to tact *private events*.

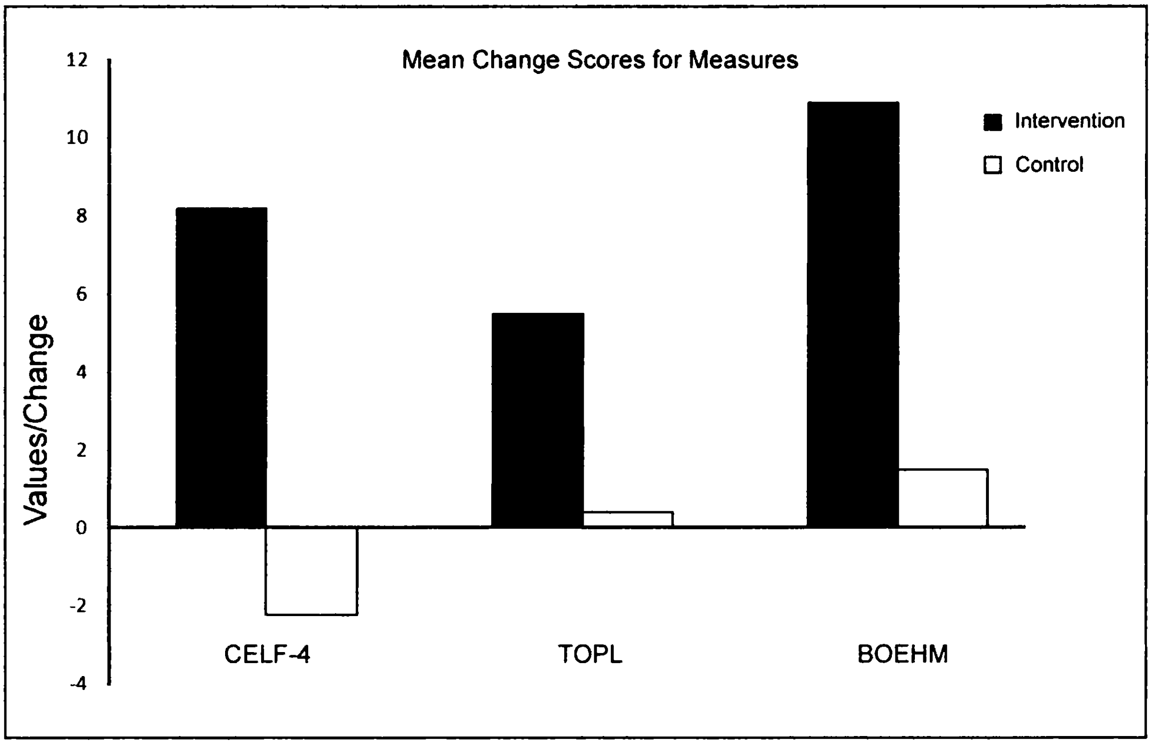
The pre and post assessments were conducted in each of the participants' homes, and were conducted by a senior behaviour analyst, with the exception of the CELF-4, and Pre-School CELF-2, which were conducted by a qualified Speech and Language Therapist in a clinical setting. The participant's programme room, where daily ABA sessions were conducted, was used as the home-based assessment setting. This room typically contained a work table, and a set of chairs, programme materials, and a book case, on which toys, and reinforcers, were clearly displayed in transparent bins, labelled with picture symbols identifying what materials were contained in each box. Reinforcement was available while the familiar surroundings were thought to reduce the level of sensory overload during assessment.

7. 3 Results

The data was analysed in terms of differences (changes) between the pre and post- testing scores between the "Intervention Group" and the "Control Group", to ascertain any impact that the instructional sequence of teaching *private events* may have had on the participants' overall (untaught) *semantic* development. These change scores were also analysed by using paired samples t-tests against a zero-baseline, these analyses highlighted whether any of the improvements, irrespective of group differences, were statistically reliable in themselves (irrespective of group differences).

Figure 7.1: Mean improvement scores across the measures for the Intervention Group and the Control Group, reported in terms of change, pre and post testing.

Mean Change Value Scores



Note: A *decrease* on the CELF-4 for the Control group suggests a stronger link between general language development and the instruction in tacts for *private events*, while significant *gains* comparatively for the Intervention Group also suggest relational gains across all three areas of language development for that group.

A comparison of the mean change in scores for *semantic* and *pragmatic* language development in the two groups, displayed in Figure 7.1, suggests that there were gains for the "Intervention Group" across all three measures. The "Control Group" displayed small increases in their TOPL, and Boehm-3, scores, but a decrease in their CELF-4 scores (reported as a raw composite score). This comparison highlighted the impact of the instruction that the Intervention Group received in tacting *private events* on both standardised semantic and pragmatic language development.

7.3.1 Between-group improvements

The independent t-tests, comparing improvement (i.e. pre to post change) scores in the TOPL, CELF-4, and Boehm-3, highlighted whether the differences in the change scores between the two groups were statistically reliable. The "Intervention Group", when compared to the "Control Group", made statistically significant improvements for the mean change score across measures: *TOPL Test of Pragmatic Language,* $t(9) = 5.45$, $p < 0.001$; *CELF-4 Clinical Evaluation of Language Fundamentals*, $t(9) = 3.02$, $p < 0.001$; and *Boehm-3* test of basic concepts, $t(9) = 7.42$, $p < 0.001$.

7.3.2 Within-group improvements

To further ascertain the pattern of differences within each group, (rather than between group comparison) the improvement (change) scores on all overall outcome measures were analysed using paired samples t-tests, which compared improvement scores to a zero baseline. This examined if the changes from baseline were statistically significant, irrespective of group differences.

Intervention group. This analysis revealed that the intervention group made statistically significant improvements, in the TOPL, $t(9) = 9.15$, $p <0.001$; CELf-4, $t(9) = 5.02$, $p< 0.001$; and in the Boehm-3, $t(9) = 9.33$, $p < 0.001$, when compared to zero baseline.

Control group. In contrast to the "Intervention Group", the "Control Group" made no improvements in any of the scales when compared to a zero baseline. The scores were as follows. In the TOPL, $t(9) = 2.17$, NS; CELF-4, $t(9) = 1.63$, NS; and on the Boehm-3, $t(9) = 2.04$, NS.

The pre and post-testing between groups also revealed an increase in age equivalence on the TOPL, from a mean of 3.0 years (pre testing) to a mean of 4.3 years (post testing), while these scores for the "Control Group" remained unchanged at a mean of <3.0 years. Examination of the CELF-4 scores revealed an improvement in percentile rank for the "Intervention Group", from a mean of 1-2% during pre-testing, to a mean of 4-5% during post-testing, while the scores in the "Control Group" remained static, with a mean of between 5-6% during pre-testing, and a mean of 6% during post-testing. The percentiles for the Boehm-3 also reveal mean increases, pre and post-testing for the "Intervention Group" from a mean of 12-14th to a mean of 14th–17th, while "Control Group" were in the 11 -12th during pre-testing and the 1st-2nd during post-testing.

Table 7.2: The number participants pass/fail on "Sally-Anne Test", and the Chi-Square, posting testing value for probability of occurrence.

	Passed Pre-testing	Passed Post-testing	Chi-Square Post-testing
Intervention	0	8	0.53
Control	0	2	0.99

The pre- and post-testing scores for the Theory of Mind "Sally-Anne" Test, which was scored as pass or fail, revealed that no participants passed this test prior at baseline, but that 80% of participants passed post-intervention in the "Intervention Group", while only 20% passed at follow-up in the "Control Group". To examine differences with categorical variables, separate chi-tests were conducted between the pass rate of both groups at baseline, and at follow-up post, testing. At baseline, there was no difference between the groups in terms of their probability of passing the Theory of Mind Test (Sally-Anne Test), and a chi-square test, unsurprisingly, revealed this was not statistically reliable, $p > 0.99$. However, a chi-square conducted on the pass results at follow-up revealed a statistically significant difference between the groups, $X^2(1) = 6.0$, $p < 0.01$.

7.4 Discussion

The effectiveness of a teaching sequence, designed to condition the *private event* as part of the verbal behaviour repertoires of children with ASD, was examined in this study. The between group comparison presented here seems to suggest that the "Intervention Group" gained additional untaught *pragmatic* and *semantic* skills, after an intensive sequence of instruction in *private events* (see Chapters 2 to 6), when compared to the "Control Group", who did not receive this instruction. The "Intervention Group" also appeared to have significantly improved their pass rate on the “Sally-Anne” Theory of Mind Test, suggesting that improved perspective taking skills may have been an additional untaught outcome of the instruction in *private events.*

The primary aim of this study was to determine whether there would be collateral gains to the improved emotional literacy that was associated with the emerging ability to tact *private events*. The results here showed strong gains for the "Intervention Group" across the measures used, when compared to the "Control Group", having gained a developmental year in the Test of Pragmatic Language (TOPL), and multiple percentiles in both the Clinical Evaluation of Language

Fundamentals (CELF-4), and the Boehm Test of Basic Concepts-3 (Boehm-3), when compared to the "Control Group", whose scores either remained static or decreased from pre to post testing.

Instruction in the language of *private events* remains a contentious issue within behaviour analysis (see Friman, Hayes & Wilson, 1998a, 1998b; Lamal, 1998), where the legacy of Skinner (1957) has encouraged a stronger focus on functional *mands* and *tacts* (Lovaas, 1981; Partington & Sundberg, 1998; Sundberg, 1998), and less attention to the *private event*. Although there is an extensive body of evidence showing the positive impact that ABA has had in teaching children with ASD functionally relevant skills (Partington & Sundberg, 1998; Schauffler & Greer, 2006), there is still no clear evidence that this has had any impact on the core deficits of ASD, particularly in regards to the social-emotional deficits that are central to the disorder. In order to bridge this disparity, the science of behaviour analysis needs to be applied to the language linked social-emotional development of children with ASD. This current study has shown that teaching specific skills in emotional literacy impacts on more general linguistic skills.

In addition, the construct known as Theory of Mind, has also remained at the centre of much debate (Baron-Cohen, Leslie & Frith, 1985; Wimmer & Perner, 1983). The current study has shown that the teaching intervention presented in the current series of studies, lead to improvements in this ability. Although the ability to perspective take was first thought to be a *static* determinate (Baron-Cohen, Leslie, & Frith, 1985; Wimmer & Perner, 1983), the findings reported here support a growing body of evidence that suggests this ability may be a learned behaviour (Bowler, Stormm, & Urquhart, 1993; Hadwin, Baron-Cohen, Howlin & Hill, 1996). In fact, the current data is consistent with the view that “theory of mind” may be linked to skills required to tact *private events*, as the foundation of being able to perspective take may be based on listener-speaker proficiencies in the language of emotions. Once children have access to the language of *private events*, they can then begin to explore their forms and functions (Lohmann & Tomasello, 2003), being maintained by the contingencies associated with them, which are available in their verbal communities.

Together, the findings presented here are consistent with the suggestion that the skills necessary to mediate the core deficits of ASD are linked, in part, to improved emotional literacy, demonstrated here as the "Intervention Group's" improved ability to tact *private events*. The gains made by the "Intervention Group" in their pragmatic language skills, and in the "test of false beliefs", suggest that the language of *private events* can lead to gains in both language and perspective taking tasks. Collectively, these results also advocate the inclusion of instruction in *private events* into ABA interventions, as a core component of the broader verbal behaviour content offered in home and school based instruction. The language of emotion needs to be targeted for instruction, and not thought to be a generative gain of improved verbal behaviour when teaching children with ASD.

The noted gains in *semantic* and *pragmatic* language abilities in the "Intervention Group", might also offer evidence that a *behaviour cusp* is interwoven into the ability to tact *private events* (Greer & Keohane, 2008; Rosales-Ruiz & Baer 1997), where the child may have many of the prerequisites to tact *private events*, but nevertheless requires additional instruction in their form and function, after which other behaviours may be shaped by these new contingencies (Bosch & Fuqua, 2001). These cusps can be thought of as verbal developmental capabilities, which accelerate learning, by allowing children to acquire tacts in different ways (Greer & Keohane, 2008). It is perhaps the extension of the tact itself that is a cusp, as the speaker is reinforced by the listener for tacting the *private event* (Greer & Speckman, in press; Pistoljevic, 2008; Pistoljevic & Greer, 2006; Reilly-Lawson & Walsh, 2007). Attainment of these cusps, such as learning the generative skills to tact *private events*, following the initial instruction, allows for the attainment of a goal that was previously unachievable. In addition to the suggestion of a behavioural cusp, the increased levels of social reinforcement, which accompanied the instruction, may also have had a strong role to play in the improvements seen in the "Intervention Group's" *pragmatic* skills (Kohler, Strain, Maretsky & DeCesare, 1990; Pierce, & Schreibman, 1995).

As children with ASD struggle not only with the *semantics* and *pragmatics* of the language of emotion (Charlop & Walsh, 1986; Hobson, Ousten & Lee, 1989; Tager-Flusberg, 1992), and the pre-requisite behaviours for social interaction (Bolting & Conti-Ramsden, 2000; Dawson, Troth, Abbot, Osterling, Munson, Estes & Liaw, 2004; Donley & Greer, 1993; Hwang & Hughes, 2000), it remains ever more imperative that behaviour analysis begin to develop instructional sequences and the necessary skills to teach *private events*, in a generative and functional context.

The results of the present study suggest that children with ASD, who were systematically taught sets of *private events*, to generalize these, and to tact the public correlates of the *private events* of others, benefited across new and untrained language areas. Although the intervention focused on tacting specific *private events*, in a limited context, the collateral gains of this instruction, including increased levels of spontaneous language, and decreased levels of inappropriate behaviour, suggest that the generative language gains achieved have positively impacted on the core deficits (e.g. perspective taking skills).

8 DISCUSSION

Children with ASD are often defined in terms of a triad of impairments, which involve: delays in language, a disorder in social interaction skills, and self-stimulatory behaviours, which further interfere with their ability to socialise in a typical manner (Argyle, 1987; Charlop & Haymes, 1994; Cox & Mesibov, 1995; Hobson & Lee, 1998; Kanner 1953; Rutter, 1968; Wing & Gould, 1979). One of the threads that link these difficulties is an inability to form normal affective relationships, based on a shared understanding of the language of emotions, and the skills to self regulate these emotions (Astington, 1986; Bloom & Capitides, 1987; Bolting & Conti-Ramsden, 2000; Braveman, Fein, Lucci & Waterhouse, 1989; Tager-Flusberg, 2000): "*The rhythmic interweave of emotions and thoughts is crucial to an individual's development and to prevent social isolation and destruction", and remains one of the greatest challenges children with ASD face*" (Blackmore-Brown, 2002; p.164).

Recognising how another person feels challenges children with ASD, and interferes with the development of their own social language and behaviour (Baron-Cohen, 1991; Campos & Steinber, 1981; Charman, Swettenham, Baron-Cohen, Cox, Baird & Drew, 1997). This deficit makes it both difficult to build friendships, and experience genuine empathy for others. One way in which this problem may be overcome is to teach children on the autistic spectrum to tact their own *private events*, and, equally, to tact the public correlates associated with the display of the 'emotions' of others (Betherton, Fritz, Zahn-Wexler & Ridgeway, 1986; Dunn, 1991; Gnepp, 1983; Hall, Szechtman & Nahmias, 2003). A growing body of evidence seems to suggest that creating opportunities to help mediate this deficit, and to help foster improved self-regulation, provides children with ASD improved cognitive, linguistic, and social outcomes (see Ekman, 1982, 1994; Greenspan & Wieder, 1998; Goleman, 1996, 1998; Petrides & Furnham, 2003).

Devloping improved techniques and tactics to teach language, social interactions skills and emotions remains educationally elusive to those working with children with ASD. Examples of improved social skills development have been shown to result from special school placements (Reed, Osborne & Corness, 2007), and verbal behaviour programmes, while intensive instruction have improved language development (see Greer & Ross, 2008), although there has been a noticeable lack of behaviour analytic evidence to support the suggestion that targeted instruction in emotions and *private events* benefits children with ASD. This may be due, in part, to historical misgivings regarding the methodological concerns of any study of *private events* (see Lamal, 1998; Place; 1993; Skinner, 1957), rather than stemming from a lack of interest from the field of ASD (see Baron & Baron, 1992; Bretherton & Beeghly, 1982; Donnellan & Kilman, 1986; Greenspan & Wieder, 1998; Schreibman, 2005). In fact, even within the field of ABA, which has continually been shown to improve the lives of children with ASD educationally, socially and physically (see Greer, 2002; Johnson & Layng, 1994; Lovaas, 1981; Maurice, Green & Foxx, 2001; Maurice, Green & Luce, 1996; Partington & Sundberg, 1998), there is a growing movement, which suggests that behaviour analysts should indeed be studying emotions (see Friman, Hayes & Wilson, 1998a; Friman Wilson & Hayes, 1998b).

As the debate slowly shifts away from 'should' emotions and *private events* be investigated, to 'how' can emotions and the *private events* be investigated, while maintaining a fidelity to the science of behaviour analysis and to the rigours of its methodology, contributions from both behaviourism and developmental theory may be required. Working together, theory and practice, might help provide innovative solutions to the difficulties practitioners face in teaching children with ASD face social and emotional developmental sequences.

Psychology has long been interested in emotions (see Dennett, 1978; James, 1950; Lange, 1922; Maslow, 1987), although this interest has often shied away from understanding the complex emotional world of children with ASD. Instead, they have often adhered to rigid hierarchies (see Piaget 1959, 1952), and have lacked the insight to individualize expectations, and task-analyze skill deficits to help children with ASD improve their social/ emotional language development (Lovaas, 1981). It is in this context that Behaviourists should begin to ask questions about the form and function of tacts of *private events*, with the weight of its long tradition in defining verbal behaviour as a from of operant behaviour (Skinner, 1957), rather than as an indefinable innate structure (Chomsky, 1972). Rather than being an innate structure, Behaviourists recognize the potential of each individual to learn, and instead look to the contingencies that reinforce learning in order to reconcile these deficits. With respect to teaching a *private event*, when there is no access to the required stimuli (Skinner, 1953, 1954, 1957), a set of unique challenges needs to be met if this intrinsic deficit in children with ASD is to be effectively mediated.

Skinner (1957) suggests that there are four main theoretical areas of consideration when attempting to teach *private events* to children with ASD. Firstly, because the *private event* may be controlled by a common public accompaniment of the stimulus, a child should be taught to say "that hurts", so that reinforcement will be contingent upon the accompaniment of a painful stimulus (such as a blow or damage to tissue). Secondly, the collateral responses to the *private events* should be established in the speaker, based on other responses that may have been witnessed (such that 'my tummy aches' may be reinforced when collateral behaviours such as holding the hand to the stomach, executing certain body positions, or groaning in certain temporal patterns, is observed by the verbal community). Thirdly, reinforcement of the *private event* may be transferred to a public stimulus by virtue of common properties, as in metaphorical or metonymical extensions. Such that it may describe a pain as sharp, or a sensation as burning after being pre-exposed to a sharp knife or a burning flame. Finally, when the description of the *private event* describes the speaker's own behaviour, they need to be aware that "the original contingency may be based upon the externally observable behaviour of the organism, even though this stimulates the speaker and the community in different ways" (Skinner, 1957, p. 13).

In this study, an attempt was made to teach children with ASD to tack a *private event* in the presence of the accompanying stimulus (e.g. non-preferred play material), which when tacted, allowed the contingencies made available in the verbal community to help control that behaviour (see Chapter 2). In Chapter 3 & 4, collateral responses to sets of tacts for *private events* were also conditioned, when the participants tacted *fun*, *boring*, *liked* or *disliked* in the presence of the activity on hand (e.g. not playing with the materials appropriately served as the collateral response to boring or don't liked). While across all the studies, the social reinforcement that was offered, in combination with the opportunity to confirm their response, drew attention to observable nature of the *private event* (see Chapter 2, 3, 4, 5 & 6).

8.1 Overall Findings

The results of this series of investigations suggest that it is possible to teach children with ASD sets of tacts for *private events*, which, when tested for generalization, provides additional evidence that untaught gains are a corollary outcome. The ability of children with ASD to tact *private events*, both their own and those of others, and subsequent improvements in spontaneously emitted language interactions, engagement in appropriate play behaviours and generalization to other forms of verbal behaviour did appear to result from the sequence of instruction provided to the "Intervention Group". The Intervention Group comprised ten school aged children, with diagnosis of childhood ASD, who were taught to tact *private events*, which then functioned as conditioned reinforcers, to prompt engagement in conversations based on observation and comment, and to mediate the implicit deficit in perspective taking associated with ASD.

The overall results of this series of studies suggest that teaching children with ASD to tact *private events*, as part of their functional communication programme, increases their social language, decreases inappropriate play behaviours, and finally, results in some additional improvements across untrained *semantic* and *pragmatic* language behaviours. In the first of the studies reported in this thesis (Chapter 2), tacts for *private events* were shown to function as conditioned reinforcement for teaching non-preferred play activities, and resulted in increased levels of spontaneous language. This suggests that the ability to tact *private events* can function to reinforce new behaviours and social interaction with a language partner in children with ASD. The generalization probes, which followed this training, found that participants were then able to then tact a *private events* based on their own preferred and non-preferred activities.

The second of these studies (Chapter 3) taught children with ASD to initiate a conversation with a language partner, based on a tact for a *private event*, following scheduled play opportunities. The findings of this study suggested that children with ASD could be taught to initiate a conversation based on a *private event*, when the contingencies for shaping these tacts were firmly in place. The third in this series of studies extended the goals of the previous design in order to condition the use of more complex sentences (Chapter 4), which includes an agent, and an action *private event*, in a grammatically correct unit. The findings of this study showed that children with ASD could not only initiate a conversation, but were able to develop improved grammatical abilities by increasing sentence length and complexity. The generalization probes that followed both of these studies suggests that these same participants could then initiate a conversation, and increase the complexity of their sentence structure, across untrained stimuli.

The results of the fourth study (Chapter 5) found that these same children could then tact the *private event* of another person (e.g., the public correlate of that behaviour), by first matching-to-sample emotions to situations (e.g., *the boy is having fun because it's his birthday*), being provided with multiple exemplar opportunities to learn (match, point, tact), before being asked to tact the *private event* of the target child. The generalization probe that followed this teaching, suggested that when a set new of situations were presented, the participants were able to tact successfully the *private events* of others without targeted instruction. Following this sequence of instruction (see Chapter 2, 3, 4, 5 & 6), sets of tacts for *private events* were now established in the children's repertoires. The final question asked in this series of teaching studies, was whether children with ASD could tact changes in the expression of emotion, across both *static* and *dynamic* stimuli (Chapter 6). The results of this study found that participants could successfully tact sequenced emotion cards (*static condition*), and then tact such emotional changes from videos' of emotion shifts from onset to ending (*dynamic condition*).

The final study reported in this thesis compared the results across a set of measures between the Intervention Group and a Control Group. This study found that there were, indeed, collateral gains across the three standardized measures for the Intervention Group, when compared to the Control group, including the CELF-4, TOPL, and the Boehm-3. There was also a greater pass rate on the Sally-Anne Theory of Mind Test (ToM), compared to the Control Group, offering some evidence that ToM is not a static skill, but can be successfully taught to children with ASD, indicating some flexibility in their perspective taking skills when targeted for instruction.

In summary, the results from these studies provides some evidence that suggest children with ASD can be taught to tact *private events*, both their own and the public correlates of others, which can lead to generative spontaneous language social language interactions, and reduce engagement in inappropriate behaviour repertories.

8.2 Teaching Implications of Results

The implications of the results presented here suggest that teaching social and emotional competence, including both social language and social skills, for children with ASD should continually be tested and evaluated to discover new and more adaptable tactics and approaches. Although social behaviour requires skills across domains of communication, motivation, imitation, and social knowledge (Lord, 1993), it may also be true that social behaviour can "be defined as the behaviour of two or more people with respect to one another or in concert with respect to a common environment" (Skinner, 1957; p. 297). A social skills approach to teaching tacts for *private events* should begin by teaching children with ASD the relevant language of emotions, and then to develop improved observational skill by modelling others children, in order to help them learn from the experiences of others, rather than in isolation (Argyle, 1987; Reilly-Lawson & Walsh, 2007).

Because social-emotional behaviour is a valuable source of generalized reinforcement (Skinner, 1957; p. 299), the main features of social communication programmes, should be purposeful, determined, adaptable, coordinated and have the flexibility to be improved (Hargie, Saunders & Dickson, 1994), all hallmarks of ABA interventions (Greer, 2002). The results presented here support the suggestion that improved social communication programmes, designed to teach tacts for *private events*, should be multi-functional, affecting both the speaker and the listener, helping the speaker efficiently realize their intentions (Halliday, 1973; Skinner, 1957).

8.2.1. Social Skills Interventions

It has been suggested that children develop friendships through a set of skills that have been linked with language abilities (Berndt, 1996; Vaughn, Chard, Bryant, Coleman, Taylor & Linan-Thompson, 2000), although many social skills models don't begin by improving these impoverished language skills, but instead by practicing social interactions based on language comprehension (see Schroeder, 1996; Sonders, 2003; Spence, 1985). This research suggests that these social skills programmes should instead bring social behaviours under the control of contingent reinforcement before progressing to more advanced social interactions (Greenwood, Walker, & Hops, 1977; Groden, 1982), and improved language development (Halliday, 1973).

It has been long been known that social reinforcement can successfully condition improved social behaviours (Azrin & Lindsley, 1956; Brackbill, 1958; Kirby & Toler, 1970); while more recent studies have shown that improved play behaviours are better taught by typically developing children than by trained adults (Mesaros, 1984; Strain, 1983). This research provides additional support for these suggestions, and puts forth an argument that improving language skills, increasing social reinforcement and modelling these behaviours in an environment that is sensitive to the unique social needs of children with ASD can help improve their social-emotional skill development (Reed, Osborne & Corness, 2007; Sheinkopf & Siegel, 1998; Eikeseth, Smith, Jahr & Eldevik, 2002; Gabriels, Hill, Pierce, Rogers & Wehner, 2001). This research also proposes that teaching children to engage in "natural" social interactions does require a sophisticated use of behavioural strategies, and recognize that often social emotional programmes have neglected any systematic methods or strategies for promoting social skills (Borichm 1990; Morris, 1972; Hartup, 1970).

8.2.2 Implications for General Language Development

The research presented here has recognized that the language development of children with ASD, in particular the language for *private events*, does not always link ideas or mental concepts to experience, as it does for typically developing children (Bloom & Lahey, 1978). For typically developing children, the formation of cognitive representations of objects, and object relations helps words or signs acquire meaning in relation to each other (Chomsky, 1972); although the alternative suggestion that language development is best defined in an operant model (Skinner, 1957), where the causes of the verbal behaviour are found in their functions (Risley, 1977) is supported in this research, where the form of the *private event* was taught to children with ASD while conditioning it's functional value through reinforcement contingencies.

Although atypical language development, can then be defined as not exhibiting the verbal behaviour that society is programmed to respond to, this research suggested that targeted instruction in this language can help mediate that deficit, thereby increasing contact with the contingencies that would either strengthen or maintain these behaviours (Skinner, 1957). For children with ASD, it is unlikely that general conversation serves as a generalized conditioned reinforcer, instead requiring the use of other unconditioned reinforcers, including high levels of attention and approval to strengthen and maintain these behaviours (Gevirtz & Baer, 1958a,b); although it may also be possible to condition the verbal behaviour of the *private events* to function in the same way (see Chapter 2). Skinner (1957) distinguished between verbal behaviour that is maintained by reinforcers, usually unconditioned(mands) and those that are maintained by conditioned, generalized reinforcers (which is further divided into categories of echoic, textual, interaverbals, tacts, and autoclitics). The suggestion of this research is that language programmes for children with ASD should be more sensitive to the function of language, and articulate through improved instruction ways to strengthen the links between the way the behaviour of the listener will affect the behaviour of the speaker, particularly as it relates to the form and function of verbal behaviour know as the of *private event.*

With this understanding, the results presented here suggest that children with ASD can develop improved repertoires of tacts for *private event*s through imitation, which can then function as generalized conditioned reinforcement, and equally, lead to improved grammatical structure. For all children it is important to recognize that "the human species did not evolve because of inbuilt design: it evolved through selection under contingencies of survival, as the child's verbal behaviour evolves under the selective action of contingencies of reinforcement" (Skinner, 1974; p. 111). It is therefore essential that our teaching technologies and understanding of how social-emotional behaviours develop be continually questioned and improved.

8.3 The Effectiveness of Tacts for *Private Events* as Conditioned Reinforcers

The results from Chapter 2 suggest that tacts for "*private events*" could function as conditioned reinforcers when teaching children with ASD non-preferred play activities. This study also offered evidence that having access to these tacts, and the social reinforcement that is associated with talking about *private events*, resulted in a reduction in undesirable behaviour, including inappropriate play and manipulation of the play materials (see Chapter 2). A subsequent increase in spontaneously emitted language was a collateral gain of the instruction.

These findings suggest that having access to "typical" language exchanges, and a set of "tacts for *private events*", could, under certain conditions, function as a conditioned reinforcer when teaching non-preferred activities. The introduction of the "conversation prompt procedure" used in this study (see Chapter 2) resulted in mastery of the previously non-preferred play activities, which were learned to criterion, and maintained in both the return-to-baseline, and non-contingent, phases for all ten participants. The procedure describe in Chapter 2 also appears to have had a positive effect on spontaneously emitted language (usually in the form of pure mands and tacts), which was functionally related to teaching the children in this study to tact their "*private event*" during and after prescribed play sessions. Together, this data suggests that unique vocalizations, signs or picture exchanges, can be a relational outcome of intensive tact training, as applied here to teaching "tacts for *private events*".

A great deal of the current research into ASD has been focused on improving communication and social skills, while reducing escape, and attention seeking behaviours (Scattone, Wilczynski, Edwards & Rabian, 2002), which remain core deficits in the disorder. The findings of the research reported in this thesis offer additional support to the argument being put forth by Functional Communication Training theorists, that new forms of verbal behaviour are a type of differential reinforcement of alternative behaviour (Kurtz, Chin, Huete, Tarbox, O'Conner, Paclawskji & Rush 2003). These findings offer additional support for the body of research into the form and function of picture systems and activity schedules, used to prompt independent play and social interaction between children (McClannahan & Krantz, 2005). Finally, and perhaps most importantly, the findings presented in Chapter 2 suggest that teaching *private events* in the context of the "conversational unit" offers children with ASD an increased opportunity to be reinforced by their verbal behaviour (Donley & Greer, 1993; Lodi & Greer, 1989).

8.4 The Impact of Teaching Children with ASD to Initiate a Conversation

In Chapter 3 the investigation showed that it was possible to teach children with ASD to initiate a conversation by tacting an emotional state (i.e. a *private event*), while extending the number of exchanges to increase the complexity of the conversation. In this study, an increase in spontaneous initiations, both in trained and untrained settings, were found to be a benefit of the conversation training. This training offered evidence that children with ASD could use, and generalize, the language of emotions, after conversational exchanges were arranged and modelled for them. The period of training helped to reduce the difficulties children with ASD experience with social understanding and social relationships.

The findings of this study suggest that having access to the appropriate language to talk about selected emotional and cognitive states enabled children with ASD to initiate a structured conversational unit about their individual experience of a previously completed activity. After the introduction of a 'talk' prompt, all ten participants showed an increase in the number of conversational units initiated. These conversational units were then successfully maintained in both the return-to-baseline, and generalisation, phases. The findings of this study support the suggestion that the ability to offer more extensive and sophisticated responses from children with ASD will require explicit teaching and motivating incentives (Capps, Kehres & Sigman, 1999). By increasing the vocabulary of children with ASD, more specifically, by teaching additional tacts for *private events* (e.g. *sad*, may be *sorry*, *disappointed*, *guilty*, or *depressed*; *happy* may be *glad*, *proud*, or *loved*; and *angry* may be *jealous*, *suspicious*, or *furious*), and the contexts in which to use these tacts are used, additional generative gains may be seen.

The approach taken in Chapter 3 showed that a conversation prompt procedure could help improve social-emotional language literacy, which is often found to be absent in ABA approaches (Denham, Lydick, Mitchell-Copeland & Standberg-Sawyer, 1996). These findings offer additional support to the suggestion that a systematic approach to teaching emotions, and placing it at the heart of a functional communication system, can offer children with ASD increased opportunities to understand the expressions and situations for a set of feelings.

This study also offers additional evidence that as children become increasingly more capable of using the language of emotions (Fabes, Eisneberg, McCormick & Wilson, 1988), their ability to form relationships and interact socially will improve (Howes, 1987; Parker & Gottman, 1989; Waters & Sroufe, 1983), when either acquired generatively or taught. Emotional competency can predict academic and social success (Izard, Fine, Schultz, Mostow, Ackerman & Youngstorm, 2001; Shields, Dickstein, Seifer, Guisti, Magee & Spritz, 2001), although it will require innovative teaching strategies to children to tact a set of emotions, identify emotions by situation, and, finally, to infer their causes (Lemerise & Arsenio, 2000).

8.5 A Protocol for Teaching Children with ASD to Initiate Conversation with Increased Sentence Complexity

This study adds to the growing body of evidence that ABA can successfully teach grammar to children with ASD (Sulzer-Azaroff & Mayer, 1991; Sundberg & Partington, 1998), while questioning the suggestion that these skills do not generalize across contexts (Hwang & Hughes, 2000; Ozonoff & Miller, 1995). The evidence offered in Chapter 4 also seems to suggest that it is possible teach children with ASD to initiate a conversation based on a tact for a *private event*, while extending the grammatical complexity of their initiations. These results showed that the grammatical complexity of social language could be incorporated into an instruction in the basic language of emotions (tacts for *private events*), after systematic training and modelling is offered. These skills were also shown to generalize across untrained settings and activities, offering further evidence that an increase in spontaneous initiations was an additional benefit of the conversation training.

By arranging opportunities to use increasingly complex language during structured conversational breaks, the protocol piloted in Chapter 4 improved the linguistic skills of children with ASD in the context of socially appropriate exchanges. The social initiations of all ten participants in this study increased their usage of subject, verb, and comment (*private events*), in response to the previously conditioned '*talk*' prompt. This skill was then successfully maintained and generalized to novel setting. Together, these data suggest that children with ASD can be taught to extend their linguistic skills, while using the language of emotional or cognitive states to communicate how they felt about a previously completed play task, supporting the suggestion that the ability to emit more extensive and complex responses from children with ASD requires explicit teaching and motivating incentives (Capps, Kehres & Sigman, 1999).

8.6 The Effectiveness of Teaching Children with ASD to Tact the *Private Events* of Others

The evidence presented in Chapter 5 suggested that it is possible teach children with ASD to tact the *private events* of others. This study showed that children with ASD could acquire the language of emotional expression, and the ability to tact *private events* of others, in a controlled setting. By prompting and modelling the language necessary to tact the facial expressions for *happy*, *sad*, and *angry*, and following a match-to-sample task, these tacts were then applied to situational cues, in the form a series of contrived scenarios. The data from all children support the suggestion that children with ASD can tact the public correlates of another person's *private event*, and importantly, that these skills can be built upon from pointing to individual expression cards, to matching expression cards to situations, and then onto tacting. This study also offered evidence that the participants could extend these skills when asked to tact what makes them *happy*, *sad*, or *angry*, when shown novel sets of situations, not used during the previous phases.

Together these data offer evidence that children with ASD develop a basic understanding of the emotional states of others, after they have been taught the necessary language of emotion. This study adds to research that children with ASD are able to differentiate between emotions (Sigman & Ruskin, 1999), although they often require more time and prompts than typically developing children (Capps, Yirmiya & Sigman, 1992). Although the current results do not imply that an understanding of what causes emotion has been learned by the children with ASD, it does offers some evidence there is a capacity to learn tacts for *private events*, and systematically apply these tacts to learned and untrained situations.

The evidence presented in Chapter 5 also supports the suggestion that it may not be the inability to understand that there is a link between emotion and situation (Baron-Cohen, 1991), but instead that there is a cognitive or affective deficit (Hobson, 1989, 1990; Leslie & Frith, 1990), which interferes with the ability of children with ASD to tact the emotions of others. Although children with ASD seem to learn the conventions governing which situations give rise to different emotions, in a way that is similar to that observed in typical development (Wellman & Woolley, 1990), they often fail in referencing and distinguishing misrepresentation when it occurs (Pylyshyn, 1978), which can reduce their affective contact with others. This suggests that although children with ASD can effectively be taught that a word is attached to a situation (e.g. pain goes with falling down), they sometimes lack the generative understanding that there is flexibility in each event (e.g. by not witnessing the fall they may not understand that the other child feels pain), which requires the interpretation of multiple sources of information.

Although the present study showed that children with ASD could be taught to tact the *private events* of others, based of situations where representation matched expectation, it did not test the ability of the children to tact misrepresentation, which remains a challenge

8.7 The Ability of Children with ASD to Tact Changes in the Expression of Emotion in Others

The findings reported in Chapter 6 showed that it was possible to teach children with ASD to tact the changes in the expression of *private events*, from *happy* to *sad*, *happy* to *angry*, *sad* to *happy*, *sad* to *angry*, *angry* to *happy*, and *angry* to *sad,* and were then able to generalize this skill across untrained models. The results of this investigation contibute to a growing body of research into the social emotional development of children with ASD (see Gepner, Deruelle & Grynfeltt, 2001), although a systematic instruction in "emotional shifts", both in *static* and *dynamic* conditions, piloted here, has not previously been attempted with children with ASD.

It was proposed in this study that children with ASD could acquire the skills to tact changes in emotion, based on facial cues made available from a full face view, following targeted instruction in both *static* (photos) and *dynamic* (video) presentation. The data from all the children in this study showed that tacts for *private events*, and the ability to tact changes in the expression of emotion, increased during instruction, and was learned and then maintained in both the return-to-baseline, and the generalization phases.

The apparent difficulty that children with ASD face when recognising emotion, and the changes that can occur in such emotions, might stem from motivational impairments in either the reinforcement contingencies available for attending to the emotions of others (Kampe, Frith, Dolan & Frith, 2001), from impairments in joint attention skills required to interpret the available cues (Klin, Jones, Schultz, Volkmar & Cohen, 2002; Neuman, Spezio, Piven & Adolphs, 2006), or from neural systems that might be important for the perception of social reward, such as the ability to form representations of others as being "like me", similar in some way (Decety & Sommervilee, 2003). In order to establish an understanding of the how to tact the *private events* of others, children with ASD need to overcome limitations of implied interest in the emotional expressions of others, limitations in joint attention, and their implicit misunderstanding of "other" being like themselves.

The sequence of teaching, from *static* to *dynamic* stimuli used in this study grew from the suggestion that skill competencies, versus development sequence, (Fischer, 1980; Fischer & Silvern, 1985), would provide a successful starting point for instruction. Due to the competency children with ASD display tacting *static* stimuli (LaBar, Crupain, Voyvodic & McCarthy, 2003; Pelphrey, Morris, McCarthy & LaBar, 2007), it was believed that there would be an improved outcome in the *dynamic* stage once the language of the *private events*, and idea of sequencing the change, had been modelled in a phase not requiring either an interest in "other" or the joint attention expected of social involvement (Adolphs, Sears & Piven, 2001; Dawson, Meltzoff, Osterling, Rinaldi & Brown, 1998).

The findings of this study are encouraging, and should be interpreted in the context in which they were measured, and not as an indication that the participants have learned a mediated the deficits necessary to understand the shifts in *private events* of others, but instead as an indication that through explicit teaching the children with ASD could learn to recognize the defining physical signs of the expression of emotion in others. This study has shown that despite the difficulties children with ASD have with understanding emotion, procedures can be successfully implemented to improve their ability to tact the changes in the *private events* of others, in both *static* and *dynamic* conditions, offering a skill with social validity and significant generative value once acquired.

8.8 An Analysis of the Post Intervention Improvements in Generative Emergent Language Skills in Children with ASD.

An analysis of the effectiveness of a teaching sequence, designed to condition the *private event* as part of the verbal behaviour repertoires of children with ASD was undertaken in Chapter 7. The between group comparison presented in Chapter 7 seems to suggest that the Intervention Group gained additional *pragmatic* and *semantic* skills, after an intensive sequence of instruction in *private events*, when compared to the Control Group, who did not receive this instruction. Significant improvements were also seen in the pass rate on the "Sally-Anne" Theory of Mind Test for the Intervention Group, suggesting that a relational outcome of the instruction in *private events* may have been enhanced perspective-taking skills.

The results of this study showed that there might have been collateral gains to the improved emotional literacy that was associated with the emerging ability to tact *private events*. The results suggested significant improvements for the Intervention Group across the measures used, when compared to the Control Group, across the Test of Pragmatic Language (TOPL), the Clinical Evaluation of Language Fundamentals (CELF-4) and the Boehm Test of Basic Concepts-3 (Boehm-3), when compared to the Control Group, whose scores either remained static or decreased from pre to post testing. In addition, the ability to perspective take improved following instruction, suggesting that it is not a *static* determinate (Baron-Cohen, Leslie, & Frith, 1985; Wimmer, & Perner, 1983), but instead may be a component of a learned behaviour (Bowler, Stormm, & Urquhart, 1993; Hadwin, Baron-Cohen, Howlin, & Hill, 1996). If this suggestion were true, then the ability to tact the *private event* of another person might be a necessary prerequisite to perspective tacking, although additional investigation would be required to identify what those prerequisites were, and how they are acquired.

8.9 Theoretical Implications

The evidence presented in this thesis suggests that learning tacts for *private events* can be put under operant control, and can, indeed, be shaped in children with ASD, forming a functional part of their communication systems. What it may not explain is why children with ASD struggle to understand emotion, or what the critical pieces of this behaviour are in relation to verbal behaviour. These challenges must be met by behaviour analysis, in the applied setting, although the advances being made by Neurologists may further articulate the issues under investigation. The implications of this research, for children with ASD, should be looked at first in the context of how it might improve their ABA home and school programmes, and then in regard to the emerging literature on the behavioural cusp (Rosales-Ruiz & Baer, 1996, 1997), to help understand how such complex language can be conditioned and maintained.

8.9.1 Implication for Applied Behaviour Analysis Programmes

In order to benefit from the findings of this research, behaviour analysis needs to take a renewed interest in the *private event*, and begin testing them in the applied setting. Taking as a starting point the Verbal Behaviour programmes that distinguish many home and school based ABA programmes (Sunberg & Partington, 1998), it is suggested that tacts for *private events* be taught parallel to the intensive manding and tacting protocols that are followed in these settings. In that children with ASD might be taught to tact *thirsty*, which is reinforced by the presentation of a drink, in the same way that a mand for *drink* has traditionally be reinforced with the presentation of a drink. In addition, teaching protocols for intensive tact and mand training could also be be apllied to the *private event* (see Greer & Ross, 2008). Intensive tact training have previously been shown to be a successful means of increasing vocabulary levels, and can lead to naming (Greer & Ross, 2008; Schauffler & Greer, 2006), but has not been tried with the tact for *private events*. This may be the next step in helping to improve the verbal behaviour of children with ASD in a socially meaningful way, while impacting on the core deficits of the disorder.

8.9.2 Behavioural Cusp: An Explanatory Mechanism

The implied complexity of the tact for a *private event* shouldn't preclude attempts to help teach them to children with ASD, and should instead lead researchers to question how they are acquired in the natural environment by typically developing children. In particular, how such a complex, and yet intrinsic, form of verbal behaviour is learned. Such investigations suggest that they may be linked to a behaviour cusp in emotional language development (Greer & Keohane, 2005, 2005).

A behaviour cusp helps explain the way in which large amounts of critical information can be acquired with what appears to be a limited amount of direct instruction (Greer & Ross, 2004, 2008). If the tact for the *private event* were indeed part of a behaviour cusp, it would help explain how very young children develop the skills to form affective relationships, make friends, empathize with others and share their own experience with their verbal community without direct instruction in these behaviours (Greer & Ross, 2008; Rosales-Ruiz & Baer, 1996, 1997). If this suggestion is true that the theoretical implication would lead researchers to identify this as a cusp, and perhaps the pivotal skills necessary to induce improved social-emotional literacy in children with ASD.

8.94 Possible Implications of Neurological Investigations

A growing body of research has focused on the neurological systems required for understanding emotion, and the face processing skills, which are thought to be an underlying deficit in children with ASD (Courchesne, Townsend & Chase, 1995). These investigations have questioned how the brain responds to seeing emotions being expressed, whereas in this investigation attempts were made to condition appropriate responses to the expression of emotion in children with ASD in order to demonstrate the role that reinforcement and operant conditioning may play in developing these skills (see Chapters 2, 3, 4, & 5).

8.10 Does Neurology Hold the Key to Understanding Emotion & ASD?

Neurological studies of adults with ASD have shown that there is less activity in the fusiform cortex, and, any activity that is noted, differs from comparison subjects in the areas of activation (Hall, Szechtman & Nahmias, 2003). Additionally, fMRI scans have shown that individuals with ASD do respond to other people's faces as they changed from one emotion to another, although in a different way to people without ASD (Pelphery, Morris, McCarthy & LaBar, 2007). Individuals with ASD have also been shown to have a limited response in their right *amygdala* (sometimes called the *"amygdala* theory of autism"), when seeing emotions, whereas the right superior temporal sulcus responded in a way similar to non-autistic people (Chawarska & Volkmar, 2006). The results of this study suggest that difficulties in face processing are common for individuals with ASD, although significant improvements in these skills has been show when slow motion video or morphing has been used to improve emotional perception and social cues (Pelphery, et. al., 2007). Reduced *amygdala* volumes in children with ASD, when shown shifts in the expression of emotion, provides one possible hypothesis for the social dysfunction in ASD (Baron-Cohen, Ring, Bullmore, Wheelright, Ashwin & Williams, 2000). In Chapter 6 the ability of children with ASD to tact these shifts was shown to be possible, despite the suggestion that these children may face reduced *amygdala* volumes.

The ability to process fast moving visual events, including the expression of emotion, has been shown to be impaired in individuals with ASD. One possibility is that this impairment is due to a general deficit at the lower levels of visual-motion integration (Gepner & Mestre, 2002), while others believe this might be specific to processing emotional states (Moore, Hobson & Lee, 1997). Another argument suggest that children with ASD possess a compensatory strategy for processing moving information, which makes direct comparison to the way typically developing children process emotions from facial expression difficult (Joseph & Tanaka, 2003; Klin, Jones, Shultz, Volkmar & Cohen, 2002, 2002; Langdell, 1978). Only one study has directly explored recognition of emotions from *dynamic* facial stimuli in children with ASD (Gepner, Deruelle & Grynfeltt, 2001), where they were shown to perform similarly to control groups in recognizing basic mental states, when presented both *statically* and *dynamically*. This may be due to the ability of children with ASD to respond relationally, transferring their surprisingly good skills in tacting *static* stimuli to *dynamic* stimuli. In Chapter 6 of this investigation it was shown that children with ASD could be taught to tact from both *static* and *dynamic* stimuli, suggesting that the contingencies of reinforcement may also play an important role in the functional development of this ability.

Another possibility, which has received considerable attention, concerns which specific facial features contribute to judgements about faces. It has been shown that children with ASD do not show the normal pattern of dependence upon the eyes for judgements about the expression of emotion, and instead relied more heavily on the mouth (Spezio, van Engeland & Kemner, 2007). It is possible that individuals with ASD actively avoid the eyes, as well as displaying reduced attraction to that region of the face, and/or increased attraction to the mouth, suggesting a distinctive face-processing pattern, (Klin, Jones, Schultz, Volkmar & Cohen, 2002; Neuman, Spezio, Piven & Adolphs, 2006). One investigation into whether children with ASD have a deficit in recognizing familiar faces, showed that they had a pattern of part face superiority: full face superiority over inner face, and inner face superiority over outer face. In that study it was demonstrated that children with ASD are able to recognize familiar adults, and that they use the face feature information as controls in recognition (Wilson, Pascalis & Blades, 2006). As researchers continue to explore these questions, it is left to the Behaviour Analysts to develop improved operant procedures to help mediate this deficit, by improving the language and social skills of children with ASD.

8.11 Limitations and Future Studies

Although the current research offers valuable insights into a wide range of subjects related to emotional recognition and ASD, it is important that the limitations of these investigations be acknowledged. In each of the chapters presented here, limitations specific to those studies, have been noted, although there are more general limitations that apply across all of the investigations into *private events.*

Significantly, the very nature of enquiry into the emotional world of children with ASD, and the reliability of any study of *private events* remains a limiting factor. As Skinner suggested (1954, p.260), any science of human behaviour can be thought to: "mistrust verbal responses which describe *private events*"; where: "variables are often operating which tend to weaken the stimulus control of such descriptions, and the reinforcing community is usually powerless to prevent the resulting distortion." Equally, the terminology, and use of those terms describing emotions, presents behaviour analysis with a dilemma, as they are often arbitrary and mentalized, when functionally descriptive terms are desirable (see Fehr & Russell, 1984).

The studies presented here have not defined and measured 'emotional security' (e.g. feeling "happier", better understood, more included), the regulation of emotions (e.g. being able to control emotions), or the development of the skills that are required to solve emotion-laden problems, which are all central to emerging emotional competency, but instead sought to test whether sets of tacts for *private events* could be taught to children with ASD. Although these tacts have increased the vocabulary available to children with ASD to describe *private events*, none of the current studies have measured how these have functioned for the participants beyond the settings in which they were taught. In addition, the limited number of tacts for *private events* that were taught, combined with the highly developed social language skills necessary to differentiate between the subtleties of the language of emotion, as the complexity of these tacts increases, also remains a central limitation to these investigations. Although a set of tacts was successfully taught, providing a starting point for increasing the number of tacts, and for the teaching of the multiple synonyms for each of these words that are available, it also remains unclear whether there could be a pivitol *private event*, which would accelerate the potential to learn these tacts, both from direct instruction and from the natural environment.

While the instructional sequences tested here suggests that it is possible to teach children with ASD to tact specific tacts for *private events*, it does not imply that a generative understanding of their function has been learned. Equally, no measure of joint attention skills was taken, or of whether the understanding of the socially derived meaning of emotion were improved as a result of the intervention.

Despite these concerns, and the implication that additional work needs to be done to understand the complex role that tacts for *private events* play in the emerging language and social development of children with ASD, the findings reported here remain promising. Additional study needs to be undertaken to address the validity of these findings, and in particular to test the ability to generalize these behaviours across situations, and to the shifting and often ambiguous context of 'talking about" our emotions.

In the current research (see Chapter 2) tacts for *private events* were shown to function as conditioned reinforcement for teaching non-preferred play activities. One area of future research would be to transfer the "conversational prompt" procedure introduced in that study to naturalistic, and unscripted settings across the subject's day. In order to have a positive impact on generative language development, this prompt needs to be shown to have greater flexibility in both trained and untrained contexts.

The evidence that a "talk" symbol could be used to prompt spontaneous social language was tested in Chapter 3 and 4. An additional area of research would be to extend the use of the "talk" prompt procedure to test its applicability to the instruction of more developed social language exchanges, by extending the conversational unit, and further developing its grammatical correctness. Further study also needs to be undertaken to address the validity of these findings, and to extend the range of emotions tacted in these exchanges across untrained contexts.

In the study presented in Chapter 5, it was suggested that children with ASD could tact the *private events* of others. By matching emotions to situations, the participants showed they could recognise that an emotion was linked to an occurrence. One area of future research would be to test whether the tacts for *private events* of others taught in this study could be generalized to naturalistic settings, where the emotional states of others will be greater in quantity and variety, and more transient in nature (Fabes, Eisenberg, McCormack & Wilson, 1988).

The complexity of the task tested in Chapter 6, suggested that children with ASD could be taught to tact changes in the expression of emotion, in both *dynamic* and *static* conditions. The findings of this study need a great deal more investigation to validate them, and the differences between the tacts taught need to be further differentiated, so that when teaching *surprised*, the additional tacts of *enthusiastic*, *excited*, or *shocked*, for example, could be taught. In the current research, the emotions targeted reflected visual opposites (e.g., from *happy* to *sad*, or *happy* to *angry*), whereas future research needs to fine-tune these changes (e.g. *surprised* to *shocked*, *sad* to *miserable*), while extending the verbal repertoires to increase the exactness of the tacts for *private events*. Another area of future research would be to test whether the tacts for *private events* of others taught in this study could be taught in the context of situational information, requiring the child to tact the expression of emotion through the experience of situation-based emotions, considered a central deficit in the acquisition of "theory of mind" (Howlin, Baron-Cohen & Hadwin, 1999).

8.12 Summary

In summary, the present research suggests that recognising how another person feels remains one of the greatest challenges children with ASD face in developing social language and behaviour. To help mediate this deficit, this investigation taught children with ASD to tact a set of *private events*, while measuring the subsequent relational outcomes in spontaneously emitted language interactions, engagement in inappropriate play behaviours and generalization to other forms of verbal behaviour. The results from these studies provides some evidence that suggests children with ASD can reliably be taught to tact *private events*, both their own and the public correlates of others, which can lead to generative spontaneous language social language interactions, reduce engagement in inappropriate behaviour repertories, which suggests that the deficits of "theory of mind" may not be entirely static. The teaching innovations tried in the series if investigations presented here built upon the skill areas of the participants, including match-to-sample, and point-to-tact, and accessed well tested ABA technologies, including visual schedules and visual support to help teach children with ASD to tact private events.

Together, the findings presented here suggest that the skills necessary to help mediate the core deficits of ASD are linked, in part, to improved emotional literacy, and the ability to tact *private events.* Collectively, these results support the inclusion of instruction in *private events* into ABA interventions, extending the verbal behaviour content offered in home and school based instruction beyond pure *mands* and *tacts*. This would suggest that the language of emotion should be targeted for instruction, and not thought to be a generative gain of improved verbal behaviour when teaching children with ASD.

As children with ASD struggle not only with the language of emotion (Charlop & Walsh, 1986; Hobson, Ousten, & Lee, 1989; Tager-Flusberg, 1992), and the pre-requisite behaviours for social interaction (Bolting & Conti-Ramsden, 2000; Dawson, Troth, Abbot, Osterling, Munson, Estes & Liaw, 2004; Donley & Greer, 1993; Hwang & Hughes, 2000), it is essential that behaviour analysis begin to develop instructional sequences and the necessary skills to teach *private events*, in the applied context. Although the interventions (see Chapters 2 to 6) focused on tacting specific *private events*, in a limited context, the collateral gains of this instruction, including increased levels of spontaneous language, and decreased levels of inappropriate behaviour, suggest that the generative language gains achieved have positively impacted on the core deficits (e.g., perspective taking skills).

9 Appendices

Appendix A: *Range of correct responding (%) during preferred/non-preferred play across each phase, and mean percent correct for each phase.*

	Baseline	Teaching	Independent	Return	Non-contingent
Student 1					
Preferred	Range 92-100 M = 99.7	Range 92-100 M = 99	Range 97-100 M = 99.7	Range 100 M = 100	Range 97-100 M = 98.9
Non-preferred	Range 43-90 M = 61.4	Range 88-100 M = 95.2	Range 80-100 M = 97.5	Range 93-100 M = 98.1	Range 67-100 M = 83.1
Student 2					
Preferred	Range 93-100 M = 98.3	Range 95-100 M = 99.3	Range 97-100 M = 99.5	Range 93-100 M = 97.1	Range 90-100 M = 97.1
Non-preferred	Range 15-70 M = 41.2	Range 38-100 M = 75.1	Range 94-100 M = 97.8	Range 70-93 M = 82.4	Range 65-80 M = 72.7
Student 3					
Preferred	Range 91-100 M = 99.4	Range 96-100 M = 92.3	Range 96-100 M = 99.7	Range 100 M = 100	Range 97-100 M = 99.4
Non-preferred	Range 43-90 M = 59.7	Range 75-100 M = 93.7	Range 92-100 M = 98.4	Range 96-100 M = 99	Range 76-98 M = 89.3
Student 4					
Preferred	Range 96-100 M = 99.8	Range 96-100 M = 99.6	Range 96-100 M = 99.8	Range 100 M = 100	Range 96-100 M = 99.5
Non-preferred	Range 43-90 M = 61.9	Range 77-100 M = 91.7	Range 92-100 M = 98.4	Range 93-100 M = 97.3	Range 67-98 M = 86.1
Student 5					
Preferred	Range 96-100 M = 98.5	Range 96-100 M = 99.3	Range 98-100 M = 99.5	Range 97-100 M = 99.3	Range 97-100 M = 99.2
Non-preferred	Range 15-55 M = 31.3	Range 30-100 M = 73.2	Range 94-100 M = 98.5	Range 82-98 M = 84.8	Range 72-90 M = 83.6
Student 6					
Preferred	Range 95-100 M = 98.9	Range 88-100 M = 98.5	Range 92-100 M = 98.6	Range 95-100 M = 99.2	Range 93-100 M = 98.0
Non-preferred	Range 28-52 M = 39.7	Range 35-100 M = 78.8	Range 95-100 M = 98.9	Range 86-100 M = 93.7	Range 78-90 M = 84.2
Student 7					
Preferred	Range 98-100 M = 99.9	Range 100 M = 100	Range 96-100 M = 99.9	Range 96-100 M = 99.3	Range 96-100 M = 98.9
Non-preferred	Range 32-65 M = 50.4	Range 36-100 M = 85.3	Range 96-100 M = 99.3	Range 92-100 M = 97.0	Range 86-98 M = 91.1
Student 8					
Preferred	Range 90-100 M = 96.0	Range 88-100 M = 98.5	Range 96-100 M = 99.5	Range 96-100 M = 98.9	Range 93-100 M = 97.4
Non-preferred	Range 24-50 M = 37.1	Range 42-100 M = 84.2	Range 94-100 M = 98.7	Range 79-98 M = 86.9	Range 48-90 M = 68.9
Student 9					
Preferred	Range 96-100 M = 99.6	Range 96-100 M = 99.7	Range 98-100 M = 98.5	Range 96-100 M = 98.7	Range 96-100 M = 98.7
Non-preferred	Range 13-52 M = 29.1	Range 18-100 M = 72.3	Range 89-100 M = 97.6	Range 74-100 M = 87.6	Range 48-75 M = 60.6
Student 10					
Preferred	Range 88-100 M = 98.5	Range 96-100 M = 99.4	Range 94-100 M = 99.1	Range 92-100 M = 99.1	Range 92-100 M = 99.1
Non-preferred	Range 18-52 M = 36.5	Range 44-100 M = 85.6	Range 90-100 M = 94.5	Range 86-100 M = 92.5	Range 66-96 M = 84.2

Appendix B: *Range of correct responding across each phase and mean percent correct for each.*

	Baseline	Teaching	Return-to-Baseline
Student 1	Range 0 - 1 $M = 0.2$	Range 2 - 10 $M = 7.5$	Range 9 - 10 $M = 9.8$
Student 2	Range 0 - 1 $M = 0.2$	Range 0 - 10 $M = 5.4$	Range 10 - 10 $M = 10$
Student 3	Range 0 - 1 $M = 0.2$	Range 4 - 10 $M = 7.4$	Range 9 - 10 $M = 9.6$
Student 4	Range 0 - 1 $M = 0.04$	Range 1 - 10 $M = 6.4$	Range 10 - 10 $M = 10$
Student 5	Range 0 - 1 $M = 0.8$	Range 3 - 10 $M = 7.4$	Range 9 - 10 $M = 9.6$
Student 6	Range 0 - 2 $M = 0.6$	Range 4 - 10 $M = 8.3$	Range 10 - 10 $M = 10$
Student 7	Range 0 - 1 $M = 0.2$	Range 1 - 10 $M = 6.0$	Range 7 - 10 $M = 8.6$
Student 8	Range 0 - 1 $M = 0.2$	Range 4 - 10 $M = 7.6$	Range 9 - 10 $M = 9.4$
Student 9	Range 0 $M = 0$	Range 5 - 10 $M = 8.2$	Range 9 - 10 $M = 9.4$
Student 10	Range 0 - 1 $M = 0.4$	Range 2 - 10 $M = 6.7$	Range 8 - 10 $M = 8.8$

Appendix C: *Range of correct responding across each phase and mean percent correct for each.*

	Baseline	Teaching	Return-to-Baseline
Student 1	Range 0 - 1 $M = 0.4$	Range 7 - 10 $M = 9.0$	Range 8 - 10 $M = 9.2$
Student 2	Range 0 - 1 $M = 0.2$	Range 3 - 10 $M = 6.9$	Range 8 - 10 $M = 8.8$
Student 3	Range 0 - 0 $M = 0$	Range 2 - 10 $M = 8.1$	Range 9 - 10 $M = 9.4$
Student 4	Range 0 - 1 $M = 0.05$	Range 1 - 10 $M = 7.6$	Range 9 - 10 $M = 9.8$
Student 5	Range 0 - 1 $M = 0.6$	Range 2 - 10 $M = 9.8$	Range 9 - 10 $M = 9.8$
Student 6	Range 0 - 2 $M = 1.3$	Range 3 - 10 $M = 7.8$	Range 10 - 10 $M = 10$
Student 7	Range 0 - 0 $M = 0$	Range 1 - 10 $M = 4.5$	Range 7 - 9 $M = 8.2$
Student 8	Range 0 - 2 $M = 0.4$	Range 3 - 10 $M = 7.0$	Range 8 - 9 $M = 8.0$
Student 9	Range 0 - 1 $M = 0.4$	Range 3 -10 $M = 8.2$	Range 8 - 10 $M = 9.2$
Student 10	Range 0 - 1 $M = 0.4$	Range 3 - 10 $M = 6.8$	Range 9 - 10 $M = 9.4$

Appendix D: Range of correct responding (reported as percent correct) across each phase and mean percent correct for each.

	Baseline (A)	Match-to-Sample (B)	Match-to-Sample Independent (C)	Tacting (D)	Return-to-Baseline (A)
Student 1	Range 0-30 *M* = 14%	Range 100 *M* = 100%	Range 90-100 *M* = 95%	Range 50-100 *M* = 88%	Range 100 *M* = 100%
Student 2	Range 0-10 *M* = 10%	Range 100 *M* = 100%	Range 50-100 *M* = 81%	Range 80-100 *M* = 95%	Range 90-100 *M* = 97%
Student 3	Range 0-30 *M* = 10%	Range 90-100 *M* = 99%	Range 90-100 *M* = 99%	Range 50-100 *M* =86%	Range 90-100 *M* = 99%
Student 4	Range 0-20 *M* = 5%	Range 100 *M* = 94%	Range 50-100 *M* = 95%	Range 80-100 *M* = 82%	Range 90-100 *M* = 98%
Student 5	Range 0-10 *M* = 3%	Range 60-100 *M* = 82%	Range 50-100 *M* = 85%	Range 50-100 *M* = 83%	Range 90-100 *M* = 94%
Student 6	Range 0-10 *M* = 2%	Range 80-100 *M* = 95%	Range 70-100 *M* = 88%	Range 50-100 *M* = 85%	Range 90-100 *M* = 97%
Student 7	Range 0-10 *M* = 30%	Range 80-100 *M* = 93%	Range 60-100 *M* = 91%	Range 60-100 *M* = 89%	Range 90-100 *M* = 94%
Student 8	Range 0-10 *M* =30%	Range 60-100 *M* = 91%	Range 60-100 *M* = 86%	Range 60-100 *M* = 88%	Range 80-100 *M* = 87%
Student 9	Range 0-20 *M* = 9%	Range 70-100 *M* = 93%	Range 80-100 *M* = 96%	Range 70-100 *M* = 94%	Range 90-100 *M* = 97%
Student 10	Range 0-20 *M* = 4%	Range 70-100 *M* = 91%	Range 80-100 *M* = 97%	Range 70-100 *M* = 94%	Range 90-100 *M* = 97%

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